Juvenile Salmonid Monitoring in the Mainstem Trinity River, California, 2020

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Executive Summary — This report presents juvenile salmonid emigration monitoring data collected in 2020 at both the Pear Tree rotary screw trap site (PTRST; river kilometer [rkm] 118) and the Willow Creek rotary screw trap site (WCRST; rkm 34) near Willow Creek, California, on the mainstem Trinity River. Information collected from this project contributes to assessing the effectiveness of the Trinity River Restoration Program's habitat and flow management actions in restoring salmonid populations of the Trinity River. Monitoring at PTRST is conducted to estimate juvenile salmonid population size passing the site during the sampling season. Monitoring at WCRST is conducted to estimate juvenile salmonid population size and emigration timing during the monitoring period. Rotary screw trap deployment in 2020 was heavily affected by COVID-19 precautions and closures. In 2020, one rotary screw trap was operated at PTRST from January 13 to March 19 and May 18 to August 5, with successful sampling for 101 days of the total 205-day sampling period. At WCRST, three rotary screw traps were operated from March 10 through July 31, with successful sampling for 80 days of the 144-day sampling period.

Catch data were used to calculate proportional discharge-based abundance indices for juvenile Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), and Rainbow Trout (*O. mykiss*). Catch data of other fishes are also presented. Additionally, age of salmonid outmigrants, mean length by week, migration rates, and hatchery contributions were estimated.

Bayesian time-stratified population estimates of emigrating age-0 Chinook Salmon were calculated, however due to COIVD-19 restrictions hatchery Chinook Salmon were not marked prior to release. The weekly stratified mark-recapture population estimate only includes a total estimate and does not separate natural and hatchery populations. At PTRST an estimated 4,311,803 (95% Credible Interval (CI): *[1,601,826, 11,569,688]*) combined age-0 Chinook Salmon passed the site between January 3 and August 20. At WCRST between March 10 and July 31, an estimated 11,264,028 (95% CI: *8,038,108 - 15,580,749*) combined age-0 Chinook Salmon passed the site. Catch data of other fishes are also presented.

Juvenile salmonid emigration target dates to assess at what date 80% of the juvenile salmonid population had reached Willow Creek, and to help manage water temperatures

in the mainstem Trinity River. The estimate of the week in which 80% of the juvenile Chinook Salmon population passed WCRST, as inferred from the weekly stratified mark-recapture estimate, was Week of the Year WOY 24 (June 11–17), which occurred before the TRRP management target date of July 4. The estimate of the week in which 80% of the natural Coho Salmon age-1+ population passed the WCRST was WOY 22 (May 28–June 3). The estimate of the week in which 80% of the natural steelhead age-1+ population passed the WCRST was WOY 20 (May 14–20).

Introduction

This report presents annual data collected to: (1) evaluate the production of juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) from the upper 65 kilometers of the mainstem Trinity River below Lewiston Dam, the primary restoration reach of the Trinity River Restoration Program (TRRP); and (2) provide data to enable evaluation of the production and outmigrant timing of juvenile salmonids through the lower Trinity River in response to managed flow releases, thermal regimes, and restoration efforts. Information collected by this project is needed to address TRRP Integrated Assessment Plan objective 3, and sub-objective 3.2 (TRRP and ESSA 2009):

> **Objective 3**: Restore and maintain natural production of anadromous fish populations.
> **Sub-objective 3.2**: Increase freshwater production of anadromous fish.

Juvenile salmonid emigration from the mainstem Trinity River has been monitored since 1989 with rotary screw traps (Craig 1992; Pinnix et al. 2022). This data series report summarizes the outmigrant monitoring data collected in 2020 cooperatively by the Hoopa Valley Tribal Fisheries Department at Pear Tree (PTRST), and Yurok Tribal Fisheries Program at Willow Creek (WCRST) on the mainstem Trinity River (Figure 1). The intent of this data series report is to provide timely dissemination of data to local managers, for inclusion in agency databases, and provide basic biological information to evaluate the effectiveness of habitat restoration and flow management actions undertaken by the TRRP to restore the fishery resources of the Trinity River (USDOI 2000). In addition to quantifying salmonid outmigrant production and timing, fish condition and hatchery/natural composition of the outmigrant populations are assessed.

A technical report synthesizing multi-year datasets developed by this project will be periodically published to evaluate trends in outmigrant salmonid production, outmigrant timing, hatchery/natural contribution and condition/health (Pinnix et al. 2022). Monitoring emigrating juvenile salmonid populations in conjunction with habitat availability and suitability studies is expected to provide a direct evaluation of TRRP restoration efforts because these studies focus on the early freshwater life-history phase which is directly affected by instream conditions and management actions. In addition, it is intended that this basic information will be used by the TRRP to aid in development of a salmon production model for the Trinity River.

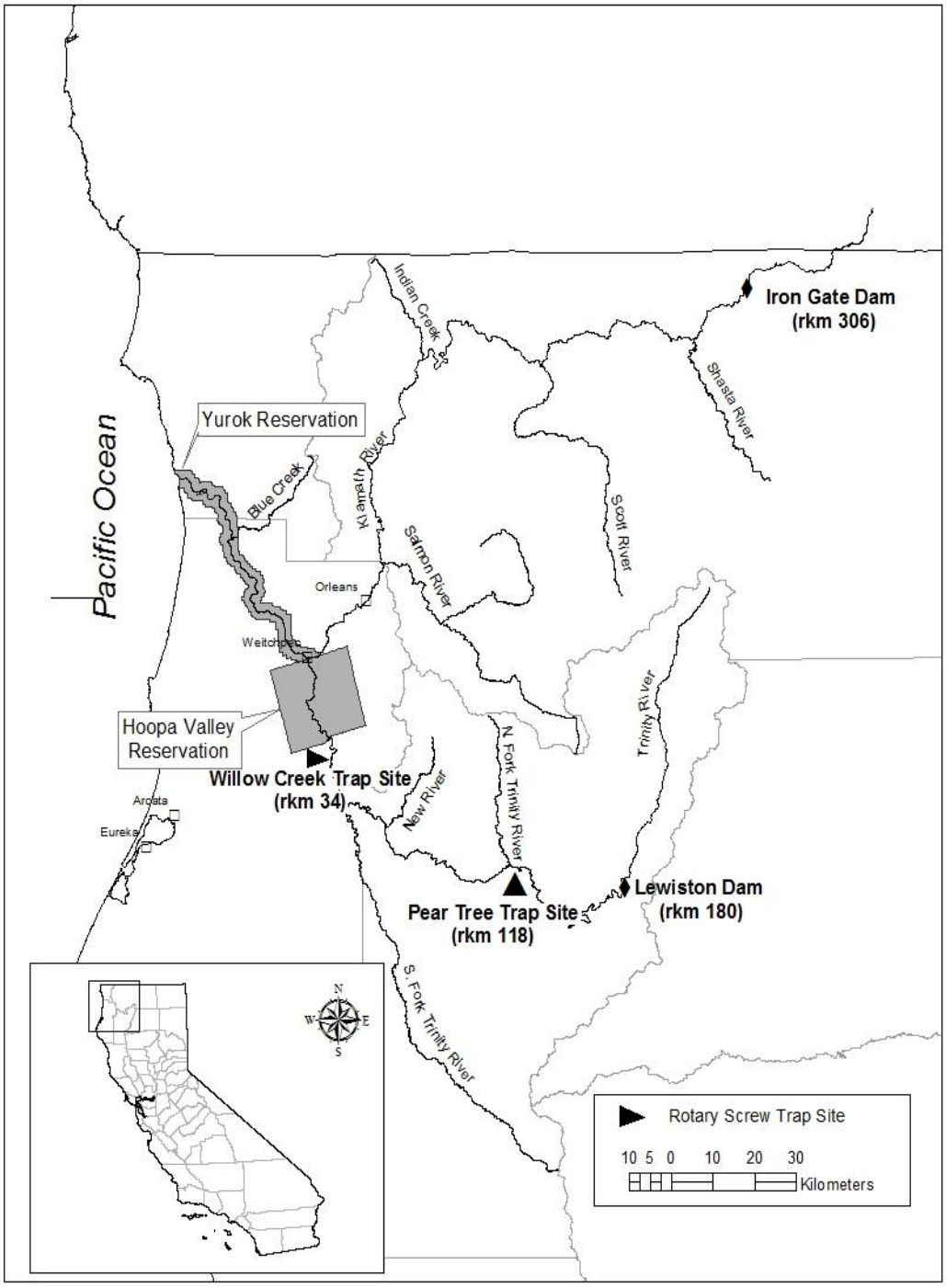


Figure 1. Location of the Trinity River Rotary Screw Trap sites near Willow Creek (rkm 34) and Pear Tree Gulch (rkm 118), California, operated by the Yurok Tribal Fisheries Program, U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Hoopa Valley Tribal Fisheries Department.

Methods

Trap Design and Operation

Sampling at the Pear Tree rotary screw trap (PTRST) site, was conducted using one 2.44 m diameter rotary screw trap. The trap generally operated from early January to late August to best observe the greatest portion of the expected emigration of naturally produced age-0 juvenile Chinook Salmon from the study reach (Green and Petros 2005; Schwarz et al. 2009; Petros 2011).

At the Willow Creek rotary screw trap (WCRST) site, sampling was conducted by deploying one to three 2.44 m diameter rotary screw traps, depending on river conditions such as magnitude of river discharge and debris load. Traps are generally deployed March through August. An effort was made to place traps in the river in early spring to sample a majority of outmigrating age-0 Chinook Salmon. This allows the evaluation of emigration patterns and relative abundances of natural and hatchery Chinook Salmon, as well as portions of the coho salmon and steelhead smolt outmigration.

Traps at both sites were anchored with 0.95 cm diameter aircraft cable to a series of steel fence stakes. One or two 0.1 x 0.15 x 6.0 m (4"x6"x10') beams were used to push the traps out from the bank. The number of cone revolutions were used to determine where and when the traps could be operated without inducing unnecessary risk to the trap; low cone revolutions (i.e., <4 revolutions per minute) necessitated moving the trap into faster water, high revolutions (i.e., >9 revolutions per minute) necessitated moving the trap to slower water or lifting the cone out of the water. Traps were fished on the edge of the thalweg during high river discharge and incrementally moved back into the thalweg as river discharge decreased. When deployed, the bottom of the cone was generally <1 m from the river bottom. A sample day was defined as the time period between the setting of the trap one day and removal of captured fish approximately 24 hours later. This period encompassed all night hours, when the majority of juvenile salmonids emigrate based on past sampling. Generally, trap checks at PTRST occurred at 1700 hours the day the trap was set and 0800 hours the following morning, with the morning check marking the end of one sample day. At WCRST, trap checks in the late morning or early afternoon marked the end of one sample day. At both locations the frequency of daily trap checks increased during peak emigration periods, with the frequency dictated by water temperatures, number of fish caught and mortality rates.

Daily trap catch data were summarized by Week of the Year (WOY), with the first day of WOY 1 commencing on the first day of the year (Table 1). All WOYs are seven days in length except the last WOY of the year and the ninth WOY during leap years, which are both eight days in length.

Water Flow and Temperature Measurements

Normal cone operating depth was 1.21 m for the 2.44-m traps and 0.762 m for the 1.52-m trap. Daily velocity measurements were taken directly in front of the cone at both PTRST and WCRST. At PTRST velocity measurements were collected as follows: the submerged portion of the cone was divided into three cells (right, center, left); within each cell, velocity was measured at 0.2 and 0.8 of the cone operating depth for 60

seconds using a General Oceanics® digital flowmeter (Model 2030; General Oceanics, Inc. 1983). Mean water velocity (ft/s) was calculated for each cell. Each calculated cell area (ft^2) was multiplied by its corresponding mean water velocity (ft/s). The values for each cell were summed, yielding an estimate of volume of river discharge sampled (Q_s) in cubic feet per second (ft^3/s). A similar process was completed at WCRST, but Q_s was calculated using only a single velocity measurement taken at 0.2 depth at the center of the cone. Discharge and water temperature records for PTRST were produced by USGS from data collected at USGS Water Resources gauge station #11-526400, which is situated approximately 61 m downstream of the trap site. Discharge data from U.S. Geological Survey Water Resource gauge station Hoopa (#11-530000 at rkm 19.9) on the Trinity River was used as a surrogate measure of mean daily river discharge (Q) at WCRST.

At PTRST, water temperature data was collected using a thermometer deployed in the trap livewell. Temperature data was recorded once or twice a day at the start of trap checks. At WCRST, water temperature data were collected using a YSI temperature and dissolved oxygen probe once per day at the start of trap checks.

Biological Sampling Procedures

All juvenile fish captured were anesthetized with Aqui-S 20e prior to processing. Up to 30 individuals of each species, age class (based on size), and presence or absence of a hatchery mark, were randomly subsampled (biosampled) from the daily catch. Biosampled salmonids were measured to the nearest mm fork length (FL), weighed to the nearest 0.1g by digital scale, and examined for external marks (stains, fin clips, tattoos, and brands), and physical irregularities. All captured salmonids that were not biosampled were tallied by species, age, and origin, and examined for external marks.

All anesthetized fish not retained (see paragraph below) were allowed to resuscitate in buckets of ambient river water before being released downstream of the trap. Rarely captured adult salmonids were not anesthetized. Adult salmonid FLs were either measured or approximated based on comparing to a known length object on the trap (i.e. live box lid) before release. Any salmonid mortality in the live box was checked for a fin clip and measured if included in the subsample. If a salmonid escaped during netting or handling before it could be identified to species or checked for a hatchery mark (i.e. adipose fin or maxillary clip), it was counted in the sample tally as an "unknown". Unknown salmonids were not included in catch totals.

When present, daily subsamples of marked hatchery Chinook Salmon were collected at WCRST. A missing adipose fin (ad-clip) was the external marker indicating a Chinook Salmon with a coded wire tag (CWT) embedded in the snout. A maximum of five ad-clipped Chinook Salmon were collected daily and sacrificed for subsequent CWT retrieval. Collected fish were stored in a freezer until time of dissection. Occasionally, ad-clipped fish were also collected for disease sampling, after which the CWTs were removed. Marked hatchery Chinook Salmon were not regularly collected at PTRST.

Juvenile Chinook Salmon were classified as age-0 (young-of-year) or age-1, based on size and date of capture. Coho Salmon were classified as either age-0 or age-1; the latter of which were much larger in size, silvery, and lacked distinct parr marks. steelhead were

classified as age-0 or age-1+ based on size at capture and resulting length frequency

Fish other than Chinook Salmon, coho salmon, or steelhead were considered non-target species. Non-target fishes captured were identified to species (or genus in some cases), enumerated, and in the case of brown trout, ammocetes, and sturgeon, up to five specimens of each species were measured to FL. Total length (TL) was measured on species without a forked caudal fin.

Hatchery and Natural Stocks Estimate

The catch of Chinook Salmon, coho salmon, and steelhead was partitioned into either hatchery or natural origin based on their external marks. Hatchery release strategies for Chinook Salmon consist of fingerling releases in the spring and yearling releases in the fall. These two distinct release periods prompted the division of the trapping season into spring and fall monitoring periods. The spring monitoring period was designated as WOY 1 through 39 and the fall period as WOY 40 through 52 in years when extended sampling was conducted. This project does not sample during the fall Chinook yearling release. Hatchery-reared steelhead and coho salmon are typically volitionally released as smolts or yearling-plus (age-1) in early spring.

Chinook Salmon

In a typical year, at both PTRST and WCRST, the proportion of hatchery Chinook Salmon in the weekly catch was estimated using Trinity River Hatchery (TRH) fin-clip rate (approximately 25%) to produce the number of hatchery Chinook Salmon captured in any given week. The estimated number of naturally produced Chinook Salmon in the weekly catch were calculated as the difference between the total weekly Chinook Salmon catch and the estimated number of hatchery Chinook Salmon. This process was not possible in 2020 due to COVID-19 related suspension of marking operations at TRH.

Estimation of weekly hatchery and natural stock contribution was carried out under the assumptions that 1) differential post-release mortality between ad-clipped and non-ad clipped fish of the same release group is negligible, 2) ad-clip and non-clip Chinook Salmon are equally vulnerable to capture, and 3) mark-fraction estimates of Chinook Salmon released from TRH are accurate.

During the beginning and end of hatchery fish emigration periods it was possible that juvenile Chinook Salmon of hatchery origin were captured but not represented by ad-clipped fish. If no ad-clipped hatchery Chinook Salmon were captured within a given week, the hatchery contribution for that week could not be differentiated from the natural component and all Chinook Salmon captured during that week were assumed to be of natural origin. Conversely, when the ad-clip proportion of the weekly catch equaled or exceeded the clip fraction of the most recent release of Chinook Salmon from TRH, all Chinook Salmon captured during that week were assumed to be of hatchery origin.

Coho Salmon

All hatchery coho salmon released from TRH were marked with a right-maxillary clip (max-clip). The weekly contribution of naturally produced coho salmon to the catch was estimated by subtracting the catch of marked hatchery fish from the total catch.

Steelhead

All hatchery steelhead released from TRH were marked with an ad-clip. The weekly contribution of naturally produced steelhead to the catch was estimated by subtracting the catch of marked hatchery fish from the total catch.

Abundance Indices – Emigration Timing

A weekly flow-based abundance index for each age class of Chinook Salmon, coho salmon, and steelhead was estimated for each WOY based on catch-effort data. Daily abundance indices ($Index_{DC}$) for each species and development stage were calculated by the following equation:

$$Index_{DC} = \frac{Catch_{DC}}{\frac{Q_c}{Q}}$$

Where:

$Catch_{DC}$ = Sum of daily catch of a species/life stage/age class from all traps at a site.
Q_C = Sum of discharge sampled (ft^3/s) by all traps at a site.
Q = Mean daily river discharge (ft^3/s) at trap site

Weekly abundance indices ($Index_{CWOYi}$) were calculated for each WOY using the following equation:

$$Index_{CWOYi} = \frac{\sum Index_{DC}}{\left(\frac{nt_i}{TD_i}\right)}$$

Where:

nt_i = Number of days in the WOY with at least one trap fishing
TD_i = Sum of the days in the WOY

The estimated proportion of hatchery-produced fish, based on catches of marked fish and marking rates, were used to partition abundance indices into hatchery and natural production. The usefulness of this index as an estimator of abundance is contingent upon assumptions that abundance is directly proportional to the percentage of river flow sampled and that individuals from a given species are equally susceptible to capture. The abundance index is not intended to represent a population estimate, but rather used to compare relative abundance between weeks during the trapping season and between years.

Emigration duration is defined as the time period between the first and last WOYs that a species of a given age and origin is present in the catch. This definition applies strictly to the sampling period and is potentially longer for species of a given age and origin that have a longer emigration period than the sampling period. Emigration peaks are defined as the largest weekly abundance index for a species of a given age and origin. Abundance indices are greatly influenced by river discharge and thus require caution in order to compare indices within or between years for absolute numbers of fish passing a site.

However, abundance indices are generally thought to be adequate indicators of emigration timing and duration if sampling occurred in all weeks of the appropriate sampling period for emigration timing of a specific species and life stage (Schwarz et al. 2009).

Migration Rate

Migration rates were not calculated for hatchery Chinook Salmon in 2020 due to COVID-19 related interruptions to trap operations and hatchery marking of Chinook. Hatchery steelhead, and hatchery coho salmon emigration rates to WCRST were estimated by dividing the distance (rkm) traveled by the number of days elapsed between the initial hatchery release date and capture date at each trap site for specific CWT codes or marked fish. Due to potential delays in outmigration during volitional releases, mean migration rates were not calculated for volitional release groups.

Population Estimation

An intensive mark-recapture technique was employed to generate population estimates for natural and hatchery age-0 Chinook Salmon. Weekly and season totals of natural-origin age-0 Chinook Salmon emigrating past the Pear Tree, and Willow Creek trap sites were estimated using a Bayesian time-stratified population estimation method (Bonner et al. 2009; Payton and Som 2021). This method requires the following weekly data: total age-0 Chinook Salmon with intact adipose fins, total adipose fin-clipped age-0 Chinook Salmon (and associated hatchery clip rate), trapping effort (weighted sample fraction, described below), marks released, and marks recaptured. The numbers of age-0 Chinook Salmon with and without adipose fins were summarized from the weekly trapping data and fin-clip rates were reported by TRH.

Traps were not operated all seven days each week, and due to operational logistics and disruptions (e.g., flawed sets due to debris), some samples were not included in the analysis. To account for variable and less than full effort, the number of days the site was operated within each j^{th} week was divided by seven to determine sampling fraction (s_j):

$$s_j = \frac{d_j}{7}$$

Mark-Recapture Technique

Hatchery-produced age-0 Chinook Salmon, provided by TRH, were used for mark-recapture trap efficiency tests at both trap locations. Marked test fish were released approximately 0.5–0.8 km upstream of the trap site to be tested. At least three meso-habitat units, including at least one riffle, were located between the release site and the trap site to allow the fish enough time and space to distribute across the river channel similarly to a natural population passing the trap site. Due to the length of the sampling week, two or three recapture days were available after the release of marked fish. These capture efficiency trials were essential data for estimating abundance via the Bayesian time-stratified model. Mark-recapture efficiency tests could not be conducted for Coho Salmon or steelhead due to the limited catch of these species, so production estimates were not generated for these species.

One or two types of marks were utilized in 2018, either freeze branding or Bismark brown. Freeze brands were applied only to hatchery-produced juvenile Chinook Salmon at TRH, which were held in raceways until brands became fully visible (approximately 5–10 days). Branded fish were transported to the appropriate release site in insulated tanks filled with aerated water. At the release site, a subsample of the freeze-branded fish was sampled for mark quality; the proportion of fish with poor quality marks was applied to the release total and excluded from the total amount released. Hatchery fish with unique brands for each WOY and site were delivered from the hatchery weekly.

Bismark Brown Y marking was applied to only hatchery-produced juvenile Chinook Salmon from TRH following Rawson (1984). The Bismark Brown Y was applied at the release site after fish were counted and transported from the hatchery.

Releases generally occurred one hour before sunset approximately 0.9 km upstream near the stream margin (PTRST) or in the late afternoon approximately 0.4 km upstream into a large, still pool (WCRST) to mix with the population of emigrating fish yet to pass the sampling site. During periods with low daily captures, fish were held for several days until adequate numbers for estimating trap efficiency were available. All recaptured fish were identified and recorded during normal trapping operations but were not counted as part of the catch for that day.

Results

Data are grouped by Week of the Year (WOY; Table 1). Graphs of water temperature and discharge through the sampling periods are presented in Figure 2.

Sampling Efforts

In 2020, trapping at PTRST began in the second of January and trapping at WCRST was initiated in late March (Table 2). At PTRST, sampling was suspended in WOY 12 and resumed WOY 16 during COVID-19 closures. To ensure that the greatest portion of the natural Chinook Salmon emigration period, as well as portions of the hatchery and natural Coho Salmon and steelhead smolt emigration periods, were sampled, efforts were made to install the traps as early as possible and continue sampling throughout the summer. Sampling at PTRST has occurred between early January and late August since 2007, and sampling at Willow Creek has occurred from March through August since 2005. It is important for readers to note that without sampling year-round, portions of annual production are excluded from estimates and indices presented in this report.

Table 1. Week of the Year (WOY) and corresponding first calendar date.

WOY	Week beginning	WOY	Week beginning	WOY	Week beginning
1	1-Jan	18	30-Apr	35	27-Aug
2	8-Jan	19	7-May	36	3-Sep
3	15-Jan	20	14-May	37	10-Sep
4	22-Jan	21	21-May	38	17-Sep
5	29-Jan	22	28-May	39	24-Sep
6	5-Feb	23	4-Jun	40	1-Oct
7	12-Feb	24	11-Jun	41	8-Oct
8	19-Feb	25	18-Jun	42	15-Oct
9	26-Feb	26	25-Jun	43	22-Oct
10	5-Mar	27	2-Jul	44	29-Oct
11	12-Mar	28	9-Jul	45	5-Nov
12	19-Mar	29	16-Jul	46	12-Nov
13	26-Mar	30	23-Jul	47	19-Nov
14	2-Apr	31	30-Jul	48	26-Nov
15	9-Apr	32	6-Aug	49	3-Dec
16	16-Apr	33	13-Aug	50	10-Dec
17	23-Apr	34	20-Aug	51	17-Dec
				52	24-Dec

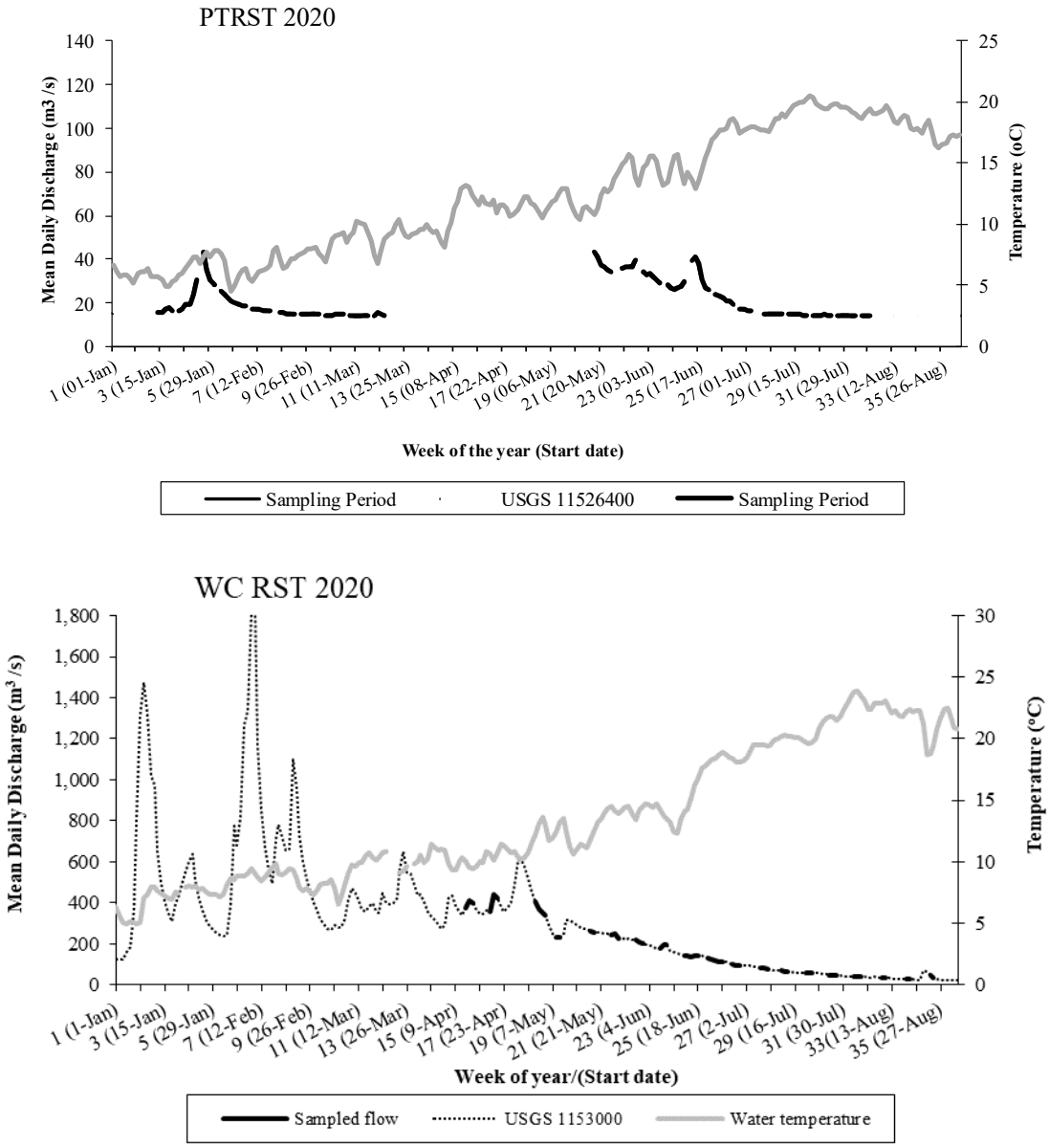


Figure 2. Mean daily discharge (m^3/s) and mean daily water temperatures (°C) as recorded near Helena (U.S. Geological Survey Water Resource gage station #11-526400) and Hoopa (U.S. Geological Survey Water Resource gage station #11-530000), California, in 2020. USGS gage #11-526400 is located approximately 100 m downstream of the Pear Tree Rotary Screw Trap (PTRST). The bolded sections on discharge series indicate sampled flows and the lightly dotted sections indicate non-sampled flows.

Table 2. Period and duration of 2020 spring/summer monitoring and percent of time sampled at Pear Tree Rotary Screw Trap site (PTRST; rkm 118) and Willow Creek Rotary Screw Trap site (WCRST; rkm 34). Distinct days are total number of days sampled with at least one trap.

Site	Trap	Start-end dates	Days trapped	Days possible	Trapping rate
PTRST	1 (2.4 m)	Jan 13 –Aug 5	101	205	49.3%
Distinct days		Jan 13 – Aug 5	101	205	49.3%
WCRST	1 (2.4 m)	Mar 10 – Jul 16	68	129	52.7%
WCRST	2 (2.4 m)	Mar 10 – Jul 30	80	143	55.9%
WCRST	3 (2.4 m)	Mar 10 – Jul 31	80	144	55.6%
Distinct days		Mar 10 – Jul 31	80	144	55.6%

Catch Totals

Catch totals of the primary salmonids of interest (Chinook Salmon (*Oncorhynchus tshawytscha)*, Coho Salmon (*Oncorhynchus kisutch)*, and steelhead (*Oncorhynchus mykiss*) are presented in Table 3. Chinook Salmon were the most commonly captured salmonid at both sites, comprising approximately 92% and 91% of the total anadromous salmonid catch at PTRST and WCRST, respectively. Hatchery salmonid releases from Trinity River Hatchery (TRH) are presented in Table 4. Catch totals of other fish species are presented in Table 5.

Abundance Estimates

Chinook Salmon Population Estimation

During the 2020 sampling season, freeze-branded and photonically-marked hatchery Chinook Salmon were delivered to the trap sites to estimate weekly trap efficiencies for generating population estimates (Appendix 7, 8). Weekly stratified mark-recapture population estimates of emigrating age-0 Chinook Salmon were calculated for combined age-0 natural and hatchery due to unmarked hatchery fish release (Figure 3). At PTRST an estimated 4,311,803 (95% CI: *[1,601,826, 11,569,688]*) combined age-0 Chinook Salmon passed the site between January 3 and August 20. At WCRST between March *10* and *July 31*, an estimated *11,264,028* (95% CI: *[8,038,108 - 15,580,749]*) combined age-0 Chinook Salmon passed the site.

Abundance Indices

The proportional discharge-based abundance indices for natural and hatchery age-0 Chinook Salmon were 396,817 and 556,771 at PTRST and WCRST, respectively (Figure 4; Table 6; Appendix 1, 2). Due to COVID-19 precautions, brood year 2019 Chinook Salmon at Trinity River Hatchery were neither coded-wire tagged nor adipose clipped, making estimating hatchery and natural origin Chinook Salmon abundance indices separately not possible. Age-0 Chinook Salmon were captured on the first day of trap operation at both sites, indicating that some age-0 Chinook Salmon emigrated prior to

trap installation. Age-1 hatchery and age-1 natural Chinook Salmon were captured at PTRST, their proportional discharge-based estimates are 911 and 4,120, respectively. Age-1 hatchery and age-1 natural Chinook Salmon were captured at WCRST, their proportional discharge-based estimates are 1,282 and 2,504, respectively.

Age-0 naturally-produced Coho Salmon abundance indices were 349 and 849 at PTRST and WCRST, respectively (Figure 5); Table 6, Appendix 3, Appendix 4). The abundance indices for age-1 naturally produced Coho Salmon were 438 and 489 at PTRST and WCRST, respectively. Abundance indices of hatchery age-1 Coho Salmon were 559 and 3,375 at PTRST and WCRST, respectively. Natural age-1 Coho Salmon were captured at the beginning of the sampling period at both trap sites, indicating that portions of each respective population emigrated prior to trap installation.

At PTRST, abundance indices of natural age-0 and age-1 steelhead were 24,761 and 6,019, respectively (Figure 6; Table 6; Appendix 5). Abundance indices of age-0 and age-1 steelhead at WCRST were 5,581 and 17,874, respectively (Table 6; Appendix 6). Abundance indices of hatchery age-1 steelhead were 398 at PTRST and 5,514 at WCRST. No age-2 steelhead were captured at PTRST or WCRST in 2020. Sampling periods at both trap sites missed portions of each respective population that emigrated prior to or after trapping operations.

Table 3. Juvenile salmonid catch totals in 2020 for trapping at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34), on the Trinity River, California, operated by the Hoopa Valley Tribal Fisheries Department the Yurok Tribal Fisheries Program. Hatchery fish totals are expanded catch based on adipose fin clip rate. NA = Not Applicable (i.e., no fish of a particular age class exist in the Trinity River).

Site	Species	Hatchery age-0	Hatchery age-1+	Natural age-0 [a]	Natural age-1+	Natural age-2+	Total
PTRST	Chinook Salmon	NA	80	26,219	366	NA	26,665
PTRST	Coho Salmon	NA	31	24	41	NA	96
PTRST	Steelhead	NA	24	1,786	430	0	2,240
WCRST	Chinook Salmon	NA	94	40,840	185	NA	41,119
WCRST	Coho Salmon	NA	524	65	37	NA	626
WCRST	Steelhead	NA	355	1,766	1,314	0	3,367

a Natural age-0 Chinook Salmon includes catch for both natural and hatchery for 2020 due to COVID restrictions which prohibited marking age-0 fish.

Table 4. California Department of Fish and Game, Trinity River Hatchery juvenile salmonid releases, 2020. AD-clipped = adipose fin clipped fish.

Species	Release season	Number released	Percentage AD-clipped or marked	Release dates
Chinook Salmon [a]	Spring	1,412,742	0.0	05/20 – 10/16
Chinook Salmon [a]	Fall	683,430	0.0	05/20 – 10/16
Coho Salmon [b]	Spring	329,639	99.9	03/20 – 03/27
Steelhead	Spring	417,948	99.9	04/20 – 04/28

a Chinook Salmon releases includes both spring and fall runs.

b Coho Salmon were marked with a right maxillary clip.

Table 5. Catch totals of non-target fish species captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) on the mainstem Trinity River, California, 2020.

Common name	Species	Life stage	PTRST catch	WCRST catch
Lamprey	*Entosphenus spp.*	Ammocoete	2,663	200
		Eyed	267	85
		Adult	1	20
Sucker	*Catostomus spp.*		17	1,095
Speckled Dace	*Rhinichthys osculus*		1,358	484
Three-Spine			130	148
Golden Shiner	*Notemigonus*		0	2
Sculpin	*Cottus spp.*		2	107
Green Sturgeon	*Acipenser medirostris*	Juvenile	0	2
Brown Trout	*Salmo trutta*	Juvenile	79	6
Sunfish	*Lepomis spp.*			
Sockeye Salmon	*Oncorhynchus nerka*	Juvenile	6	8
Fathead Minnow	*Pimephales promelas*	Juvenile	0	5
Chum Salmon	*Oncorhynchus keta*		0	1

Table 6. Juvenile salmonid proportional discharge-based abundance indices at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. NA = Not Applicable (i.e., no fish of a particular age class exist in the Trinity River). [a] Discharge based abundance estimate of hatchery age-0 Chinook Salmon was not possible in 2020 due to COVID-19 restrictions preventing hatchery marks being applied. [b] Estimates of natural age-0 Chinook Salmon includes hatchery releases.

Site	Species	Hatchery age-0	Hatchery age-1	Natural age-0	Natural age-1	Natural age 2+	Total
PTRST	Chinook Salmon	NA[a]	911	396,817[b]	4,120	NA	401,848
PTRST	Coho Salmon	NA	559	349	438	NA	1,346
PTRST	Steelhead	NA	398	24,761	6,019	0	31,178
WCRST	Chinook Salmon	NA[a]	1,282	556,771[b]	2,504	NA	560,557
WCRST	Coho Salmon	NA	3,375	849	489	NA	4,713
WCRST	Steelhead	NA	5,514	5,581	17,874	NA	28,968

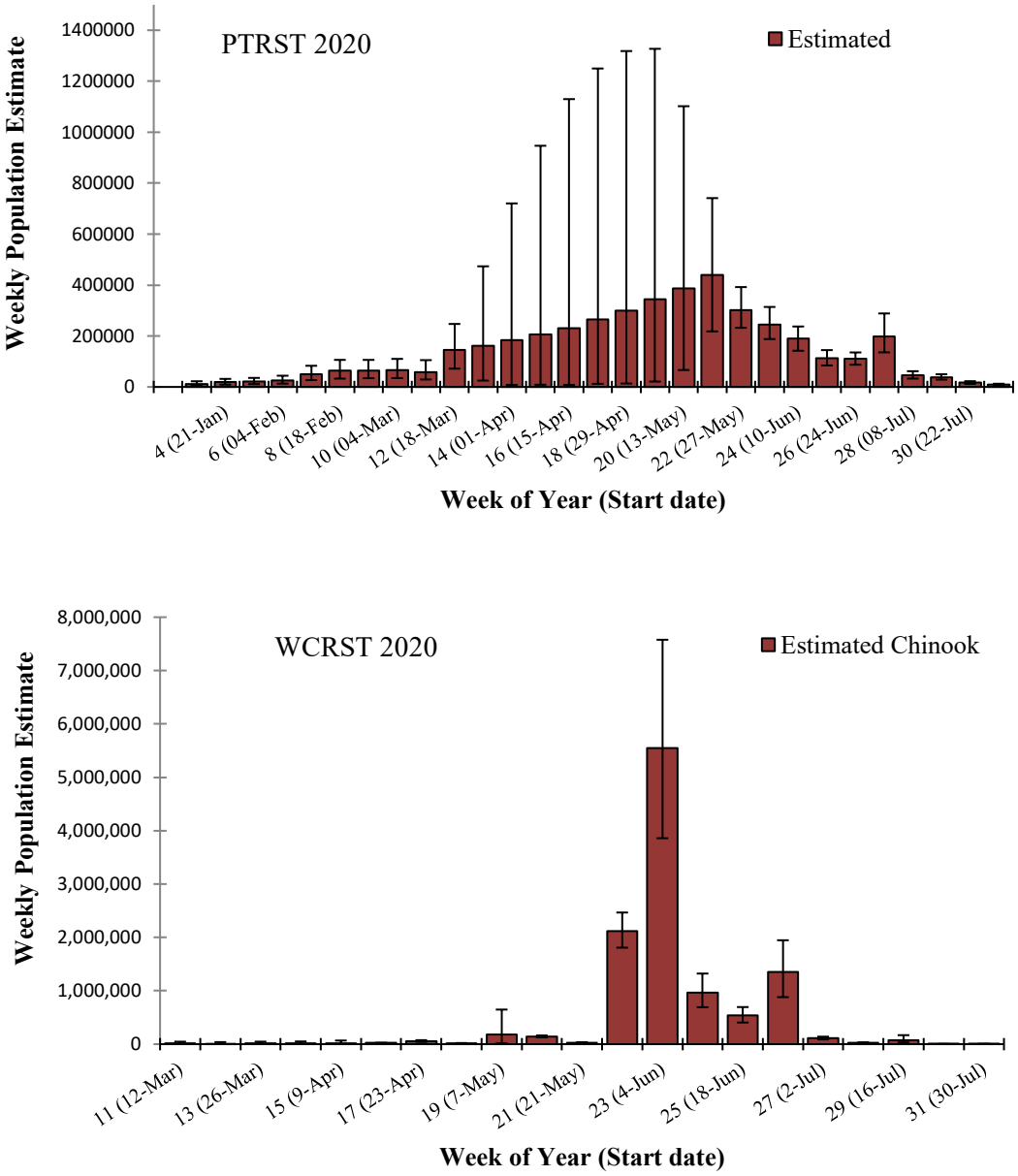


Figure 3. Weekly mark-recapture population estimates of age-0 Chinook Salmon (*Oncorhynchus tshawytscha)* captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2020. Error bars represent one standard deviation of the mean weekly estimate.

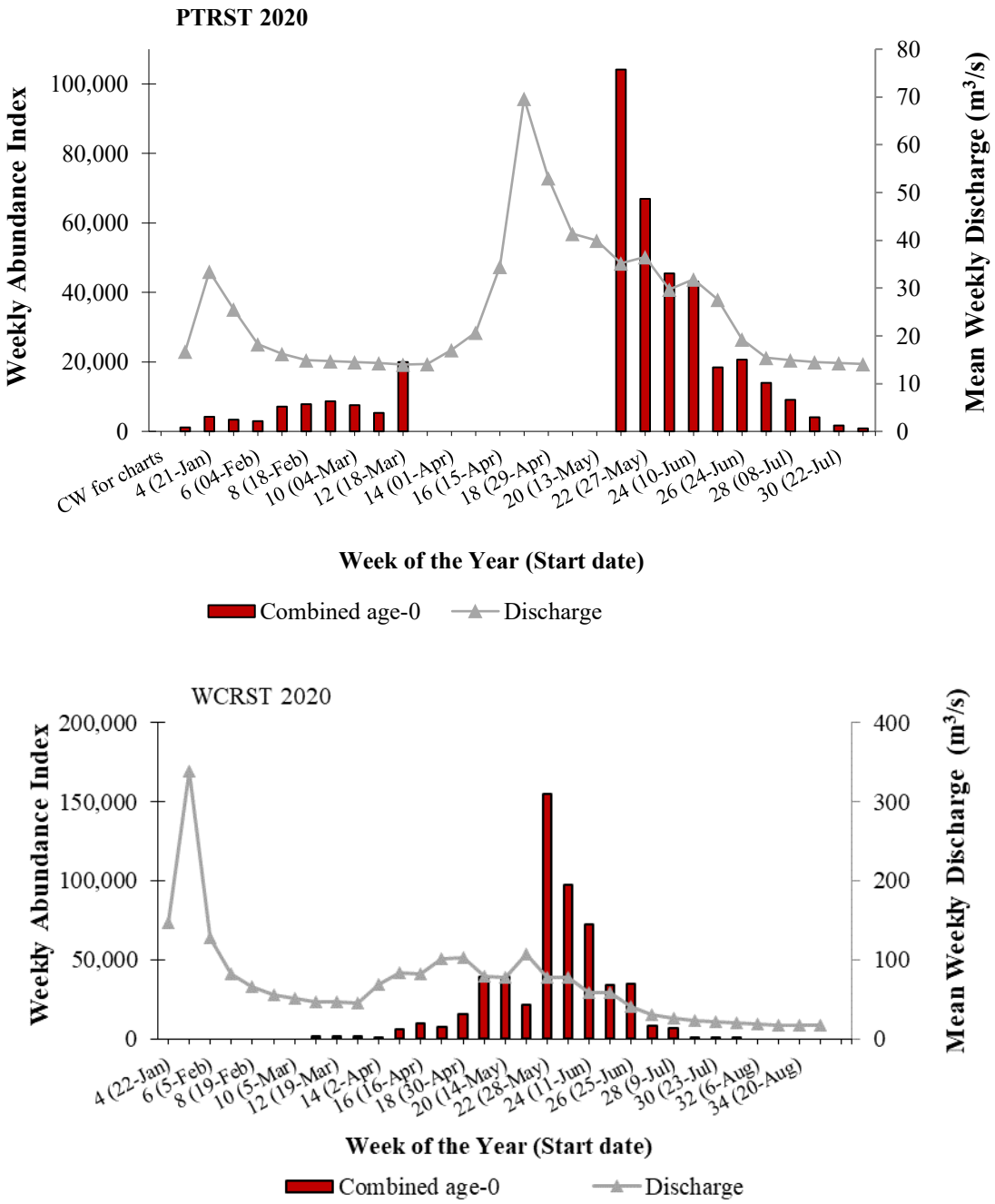


Figure 4. Weekly proportional discharge-based abundance indices for natural age-0 and hatchery age-0 Chinook Salmon (*Oncorhynchus tshawytscha)* captured at Pear Tree Rotary Screw Trap (PTRST; rkm 118) and Willow Creek Rotary Screw Trap (WCRST; rkm 34) in 2020.

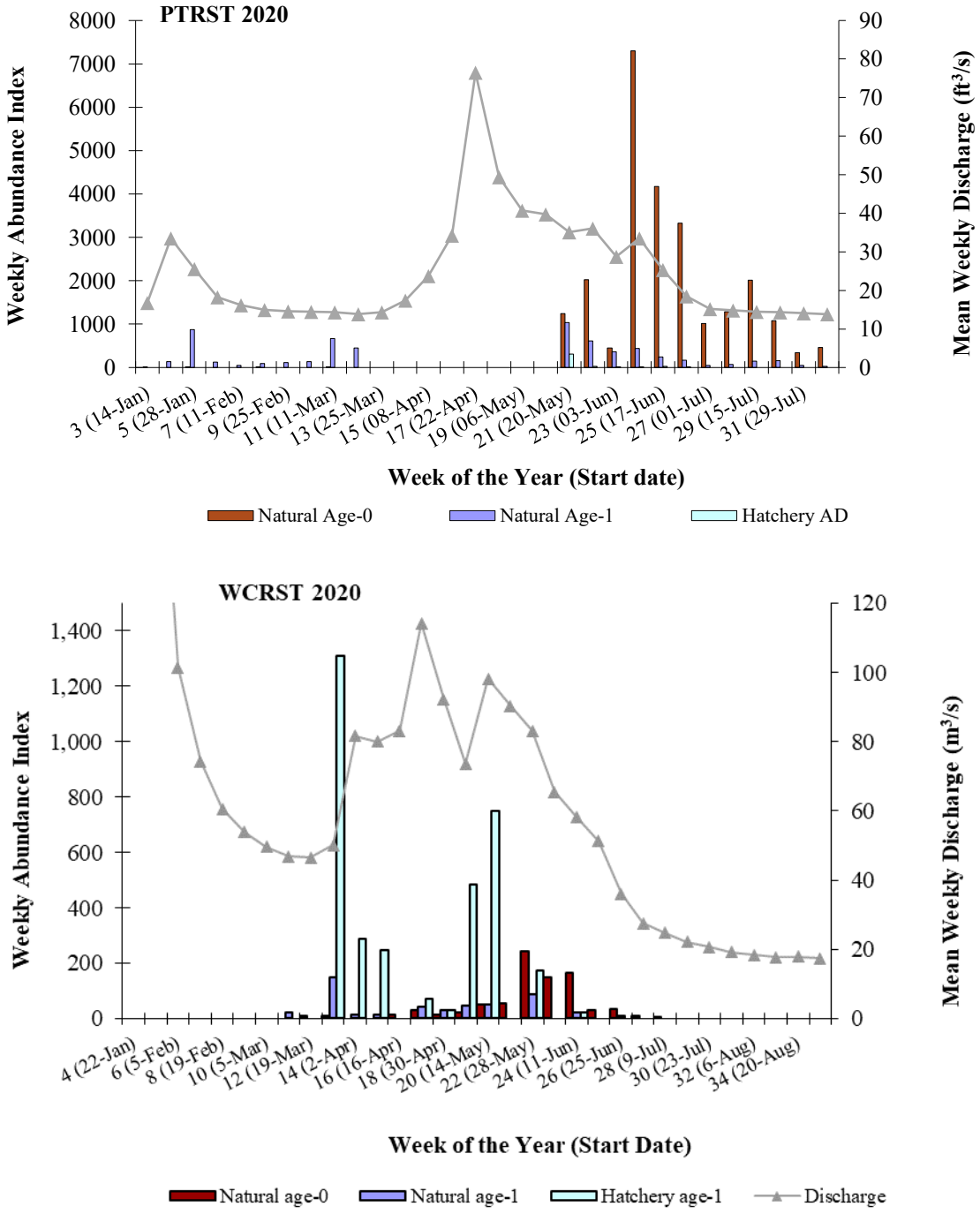


Figure 5. Weekly for natural age-0, natural age-1, and hatchery age-1 Coho Salmon (*Oncorhynchus kisutch)* captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2020.

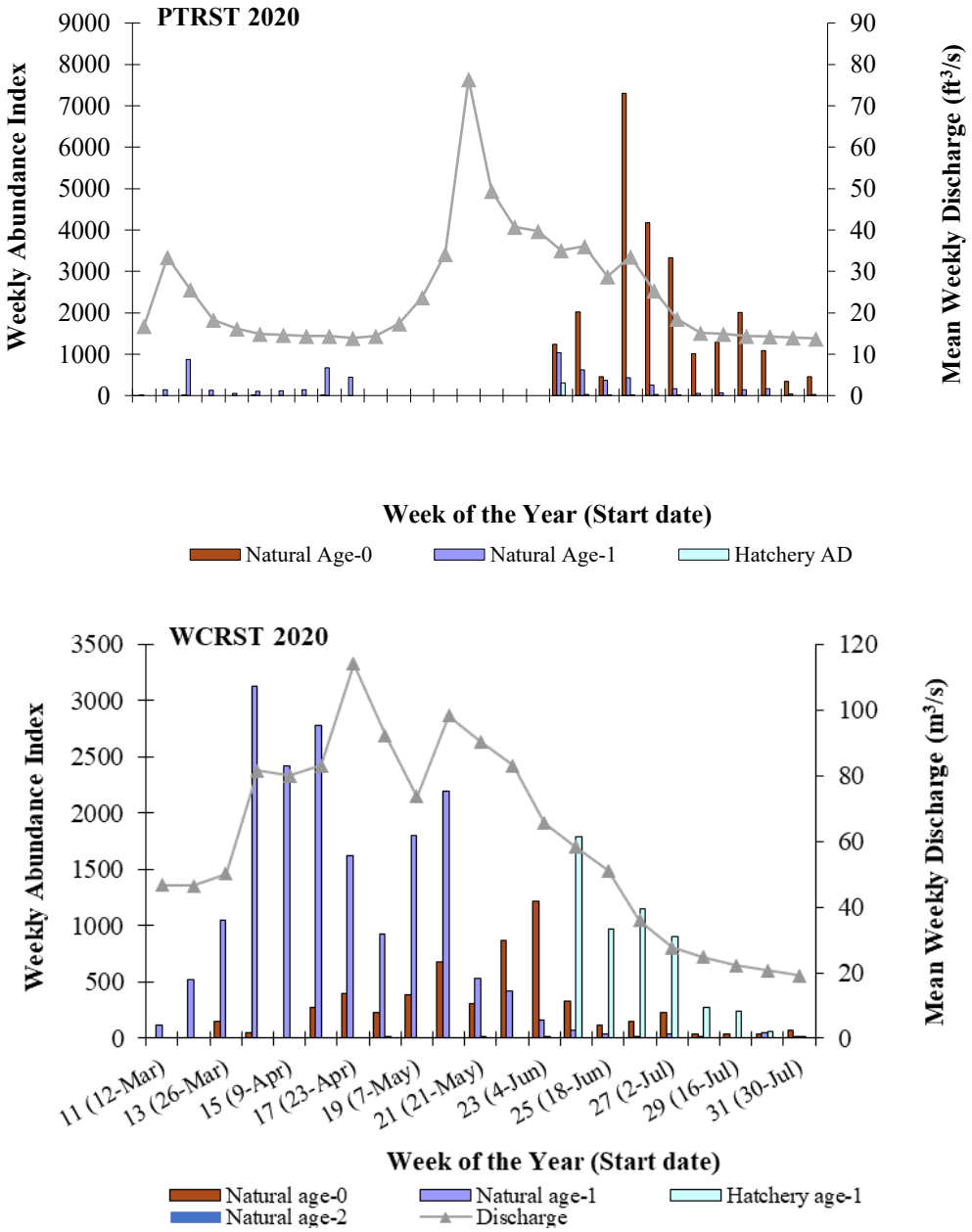


Figure 6. Weekly proportional discharge-based abundance indices for natural age-0, natural age-1, natural age-2, and hatchery age-1 steelhead (*Oncorhynchus mykiss)* captured at Pear Tree Rotary Screw Trap (PTRST, rkm 118) and Willow Creek Rotary Screw Trap (WCRST, rkm 34) in 2020.

Hatchery and Natural Contribution

Chinook Salmon were captured at PTRST and WCRST throughout the 2020 sampling season. Age-1 hatchery origin Chinook Salmon contributed 0.2% of the total Chinook Salmon at PTRST, and 0.4% at WCRST. Due to the lack of hatchery marking, determining the composition of age-0 Chinook Salmon was not possible in 2020 after the beginning of releases from the hatchery on March 24th (Appendix 1, 2).

Age-1 Coho Salmon smolts were predominantly hatchery origin at PTRST, comprising 56.1% of the total age-1 proportional discharge-based index in 2020 (Appendix 3). At WCRST, age-1 Coho Salmon emigrants of hatchery origin comprised 33.7% of the total age-1 catch totals in 2020 (Appendix 4).

Based on proportional discharge-based abundance indices at PTRST and WCRST, age-1 hatchery steelhead comprised 6.2% (Appendix 5) and 21.3% (Appendix 6), respectively, of the total age-1 steelhead observed at each respective site.

Emigration Timing

The Chinook Salmon population in the Trinity River is composed of both naturally produced and hatchery-produced fish of both spring and fall races. The vast majority of juveniles during the spring/summer emigration period emigrate as age-0 fish, with the natural and hatchery emigration periods overlapping (Table 7; Appendix 1, 2). The week marking the cumulative passage of 80% of the natural juvenile Chinook Salmon population at WCRST, as inferred from the weekly stratified mark-recapture population estimate, was WOY 24 (June 11–17), which occurred before the TRRP management target date of July 4 (TRRP and ESSA 2009). Based on the weekly stratified mark-recapture population estimate, age-0 Chinook Salmon emigration peaked at PTRST in WOY 21, though the trap was not in operation during WOY 13–20. Age-0 Chinook Salmon emigration peaked during WOY 23 at WCRST.

Table 7. Juvenile salmonid emigration duration and peak as inferred from weekly catch totals at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Values represent week of the year.

		Emigration duration[1]			Emigration peak[1]		
Site	Species	Natural age-0	Natural age-1	Hatchery	Natural age-0	Natural age-1	Hatchery
PTRST	Chinook	3-31	3-26	NA	21	11	NA
PTRST	Coho Salmon	22-31	4-21	21-24	24	11	21
PTRST	Steelhead	5-32	3-32	21-32	24	21	24
WCRS	Chinook	11-31	11-25	NA	23	13	28
WCRS	Coho Salmon	12-28	11-26	13-22	24	13	13
WCRS	Steelhead	11-31	11-31	11-25	14	14	20

1 Estimates of duration and peaks hatchery and natural origin Chinook Salmon, hatchery and natural origin age-1+ Coho Salmon, and all steelhead are difficult to estimate as peaks likely occurred while traps were not in operation due to COVID-19 closures.

The Coho Salmon population in the Trinity River is composed of both naturally produced and hatchery populations. The vast majority of Trinity River Coho Salmon emigrate to the ocean as age-1 smolts while the emigration of age-0 fish is presumably a redistribution of rearing juveniles. Natural age-1 Coho Salmon were captured in the second week of sampling (WOY 4) at PTRSR and the first week of sampling (WOY 11) at WCRST and emigration continued into May (WOY 21) at PTRST, and into June at WCRST (WOY 25) (Table 7; Appendix 4). Interpretation of data and past experience suggests that the sampling period did not encompass the entire naturally produced age-1 Coho Salmon emigration period. The week marking the cumulative passage of 80% of the naturally-produced age-1 Coho Salmon population at WCRST was WOY 22 (May 28 – June 3). Natural age-1 Coho Salmon emigration peaked in likely WOY 11 at PTRST, though a higher number of emigrants may have passed the trap during the COVID-19 closure from WOY13 through WOY 20. The peak at WCRST was in WOY 13. Hatchery Coho Salmon emigration was highest in WOY 21 at PTRST, but the peak likely occurred prior during the COVID-19 closure. At WCRST the hatchery peak was the same as the wild population in WOY 13.

The steelhead populations in the Trinity River are composed of both natural populations that exhibit highly variable juvenile life history patterns, as well as a hatchery-produced component. The bulk of age-0 steelhead are typically captured from early May through August at WCRST and PTRST; the PTRST was not operating during the typical onset of emigration, but did detect age-0 steelhead in mid-May when trapping resumed (Table 6; Appendix 5 and 6). Age-1 or older natural steelhead were present throughout the sampling period at PTRST and WCRST. Age-1+ Hatchery steelhead were released from Trinity River Hatchery from mid- to late-April (WOY 15–17) which coincided with the COVID-19 closure of the PTRST; most of the hatchery age-1+ were passed the PTRST

before the resumption of trapping in WOY 21. The majority of hatchery-produced age-1 steelhead passed WCRST by mid-May. The week marking the cumulative passage of 80% of the natural steelhead smolt population at WCRST, was WOY 20 (May 14–20). Natural age-0 steelhead emigration peaked in WOY 24 at PTRST and WOY 14 at WCRST. Natural age-1 steelhead emigration peaked in WOY 5 at PTRST and WOY 14 at WCRST. Hatchery steelhead emigration peaked in WOY 20 at WCRST and WOY 21 at PTRST, though PTRST was not operating from WOY 13 to WOY 20 and likely missed the bulk of the hatchery steelhead outmigrants.

Migration Rate

Maximum migration rates of salmonids released from TRH are presented in Table 8. These values should be considered maximums, as hatchery fish are released on a volitional basis (Table 4).

Fish Size

Age-0 Chinook Salmon weekly mean fork length at PTRST was static from week 4 through week 10, apparently due to continued fry emergence, then increased through the remainder of the season, though data from WOY 13 to WOY 20 is unavailable (Figure 7; Appendix 9, 10). Age-0 Chinook Salmon weekly mean fork length increased steadily at WCRST through early June and stabilized through the summer with the arrival of hatchery fish. Age-1 Chinook Salmon fork lengths peaked in late April at WCRST in 2020.

Natural age-0 Coho Salmon weekly mean fork lengths generally increased as the season progressed at PTRST and WCRST. (Figure 8, Appendix 9, 10). Hatchery age-1 Coho Salmon weekly mean fork lengths showed no weekly or seasonal trend at either trapping site. Natural age-1 Coho Salmon weekly mean fork length sampled at PTRST showed little increase across the season, aside from WOY 8. WCRST natural age-1 Coho Salmon showed no discernable seasonal trend, likely due to inadequate sample size.

Natural age-0 and age-1 steelhead fork lengths generally increased through the sampling season at PTRST (Figure 9; Appendix 11, 12). No Age-2 steelhead were captured at PTRST in 2020. At WCRST, age-0 steelhead fork lengths increased as the season progressed until WOY 22, age-1 steelhead remained fairly stable. Hatchery steelhead showed no trend at either site.

Table 8. Juvenile salmonid maximum migration rate from Trinity River Hatchery to Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST) sampling sites, operated by the Hoopa Valley Tribal Fisheries Department, U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, and the Yurok Tribal Fisheries Program, 2020.

Site	Species	Date first released	Date first captured	Number of days	Maximum migration rate (km/day)
PTR	Chinook	06/08/2018	NA	NA	NA
PTR	Coho	03/15/2018	NA [2]	NA	NA
PTR	Steelhead	04/16/2018	NA [2]	NA	NA
WCR	Chinook	06/08/2018	NA	NA	NA
WCR	Coho	03/15/2018	03/24/2020	4	36
WCR	Steelhead	04/16/2018	04/23/2020	3	49

1 Due to lack of hatchery marking on Chinook Salmon in 2020, migration rates cannot be generated.

2 First capture was after a multi-week trap operation suspension due to COVID-19 restrictions.

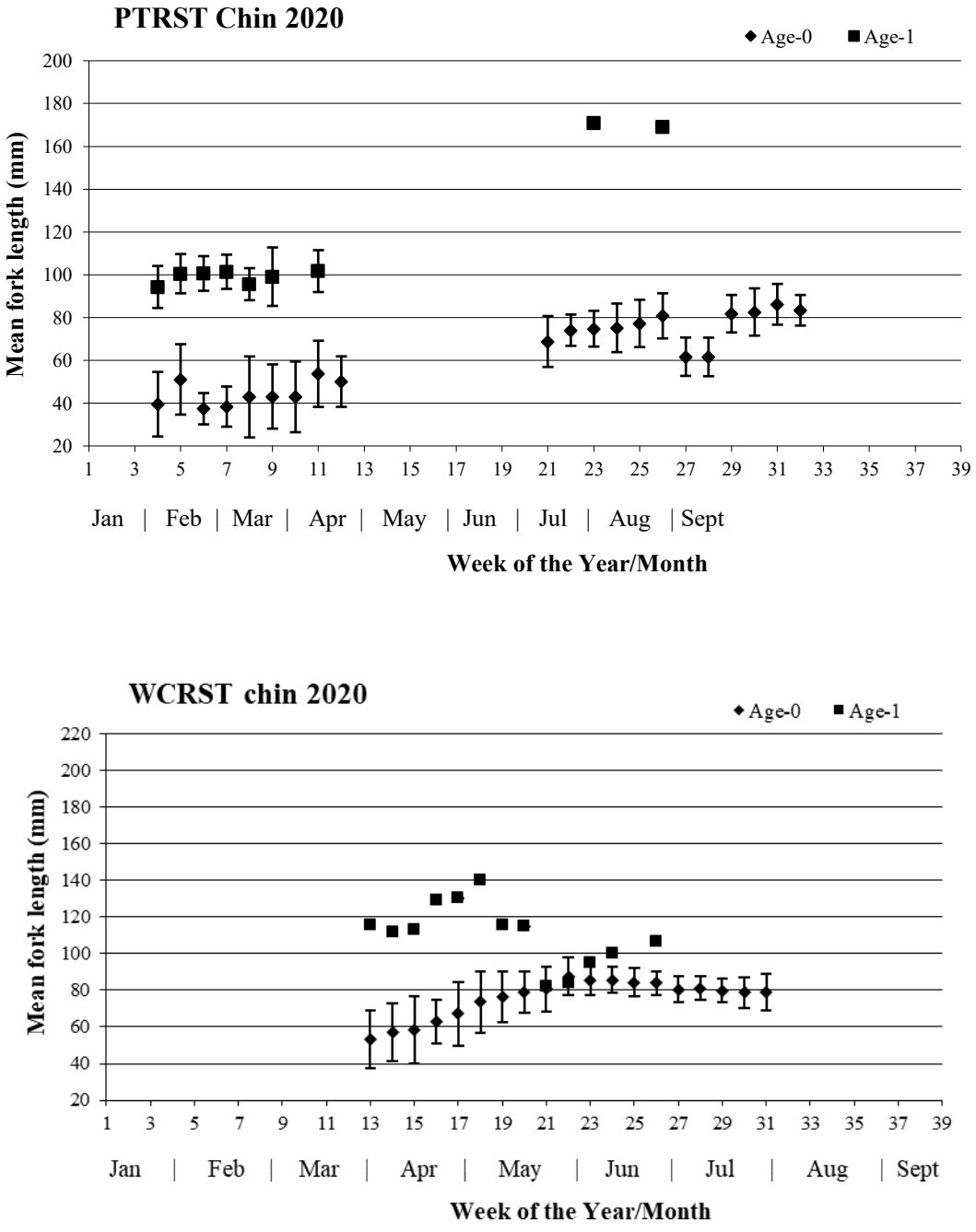


Figure 7. Weekly mean fork lengths of age-0 and age-1 Chinook Salmon (*Oncorhynchus tshawytscha)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Error bars represent one standard deviation of the mean; points without error bars represent a single Chinook Salmon in that age group in that week.

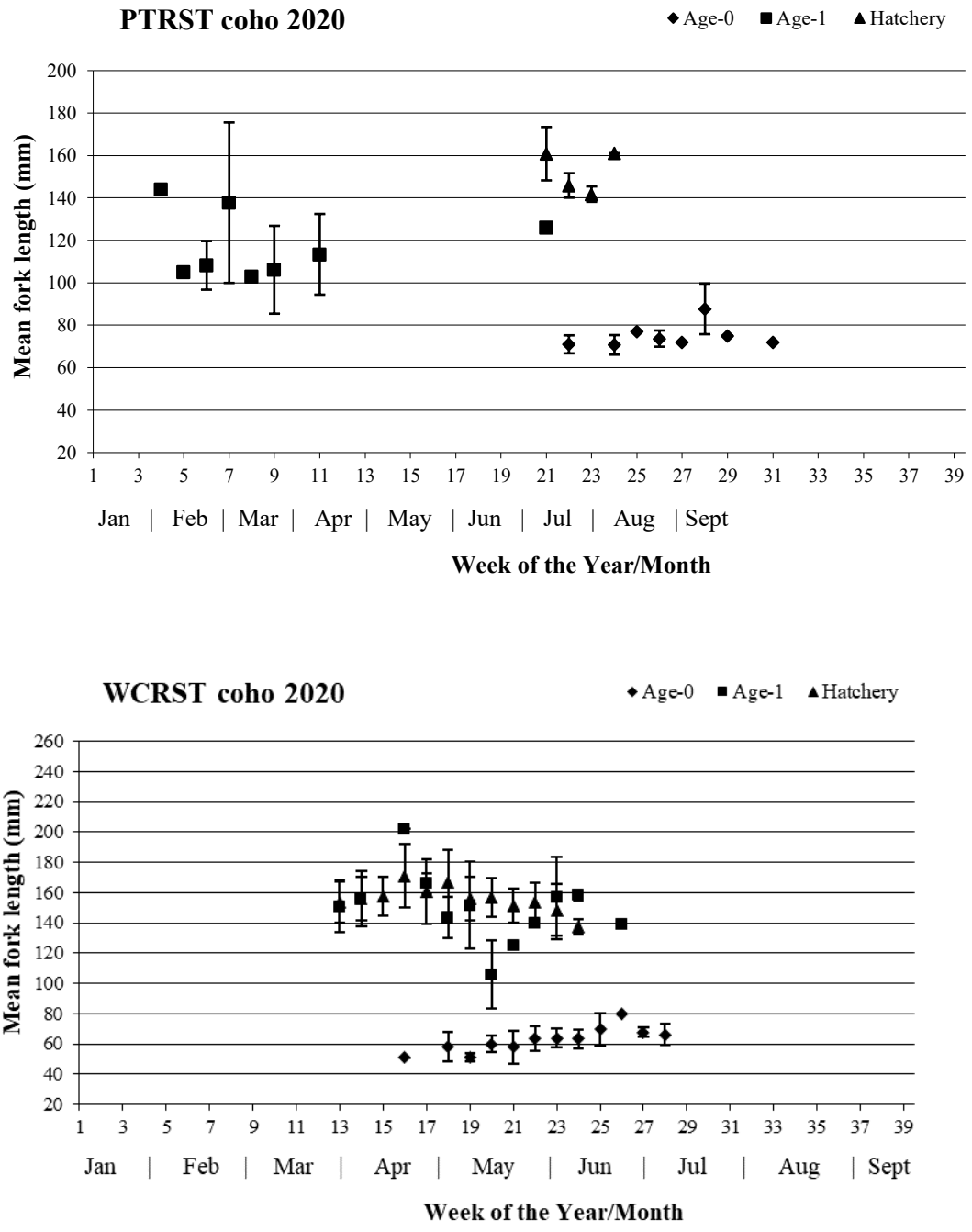


Figure 8. Weekly mean fork lengths for natural age-0, natural age-1, and hatchery Coho Salmon (*Oncorhynchus kisutch)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020.Error bars represent one standard deviation of the mean; points without error bars represent a single Coho Salmon in that age group in that week.

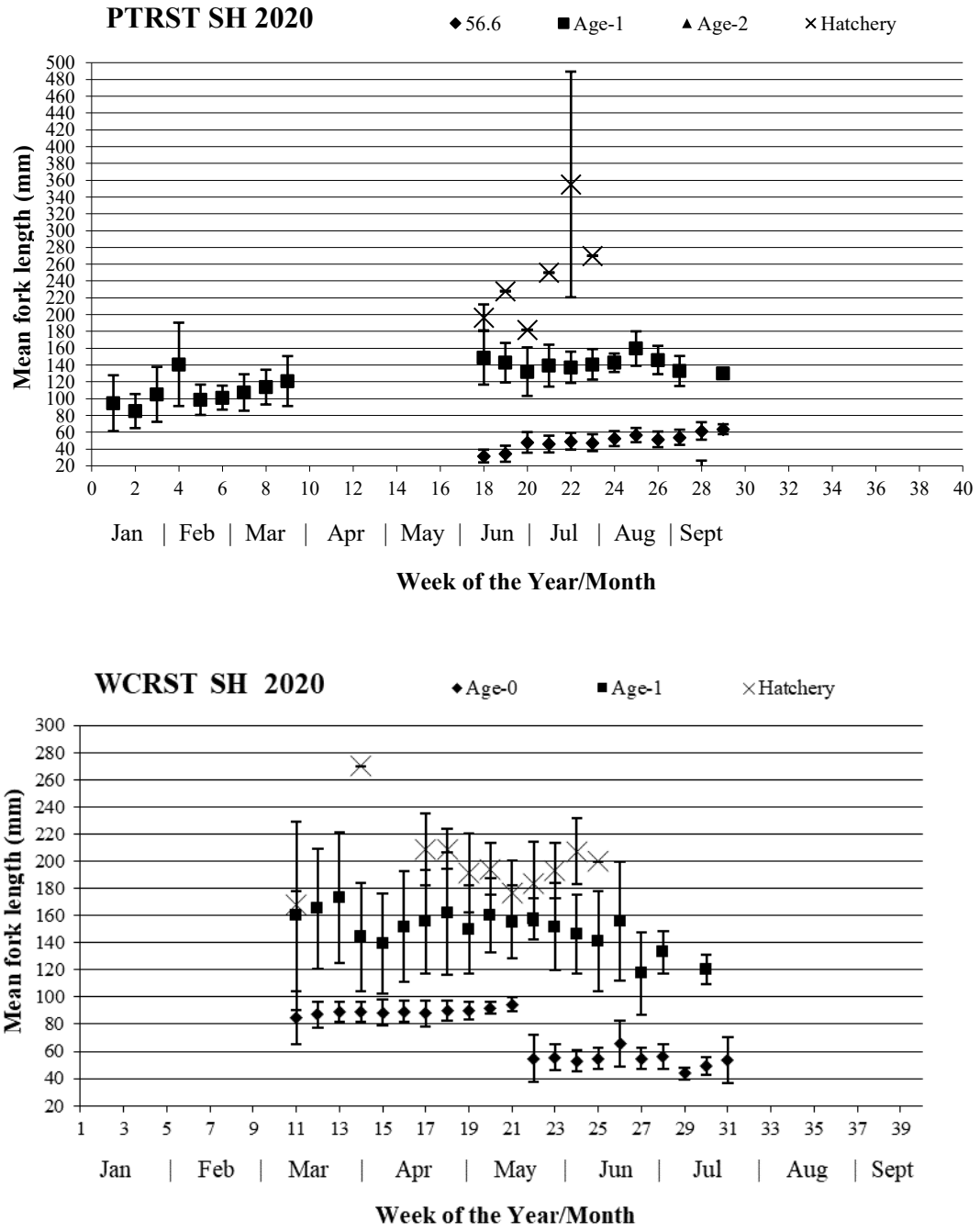


Figure 9. Weekly mean fork lengths for natural age-0, age-1, age-2, and hatchery age-1 steelhead (*Oncorhynchus mykiss)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Error bars represent one standard deviation of the mean; points without error bars represent a single steelhead in that age group in that week.

Fish Condition

Fulton's condition factor ($K = 100{,}000*(\text{weight}/\text{length}^3)$) was calculated on a subsample of age-0 (pooled natural and hatchery) Chinook Salmon larger than 50 mm, age-1 natural Coho Salmon, and age 1+ natural steelhead. Due to the inability to determine the origin of unmarked individuals, clipped and non-clipped juvenile Chinook Salmon were pooled in weekly mean calculations.

Chinook age-0 mean weekly condition factors were variable at the onset of sampling and showed no obvious seasonal trend at either site (Figure 10, Appendix 13). Age-1 natural Coho weekly mean condition factors were variable throughout the season at both PTRST and WCRST (Figure 11, Appendix 14), however, it should be noted that there were several weeks in which only one individual was captured at either site, and were excluded from the analysis. Weekly mean condition factor of natural age-1+ steelhead showed no obvious trend at either PTRST or WCRST (Figure 12, Appendix 15).

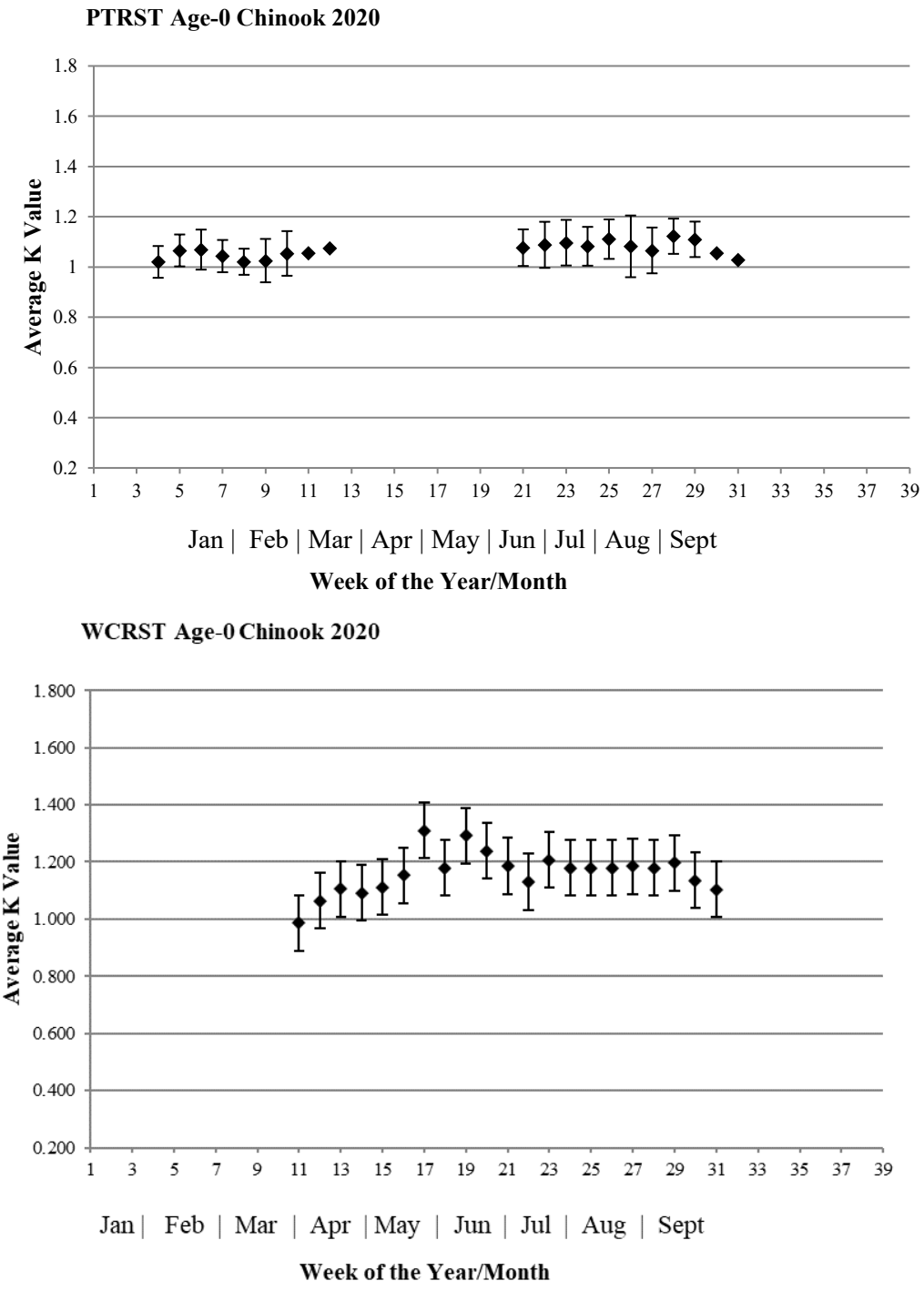


Figure 10. Weekly mean K value for pooled hatchery and natural age-0 Chinook Salmon (*Oncorhynchus tshawytscha)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Error bars represent one standard deviation of the mean.

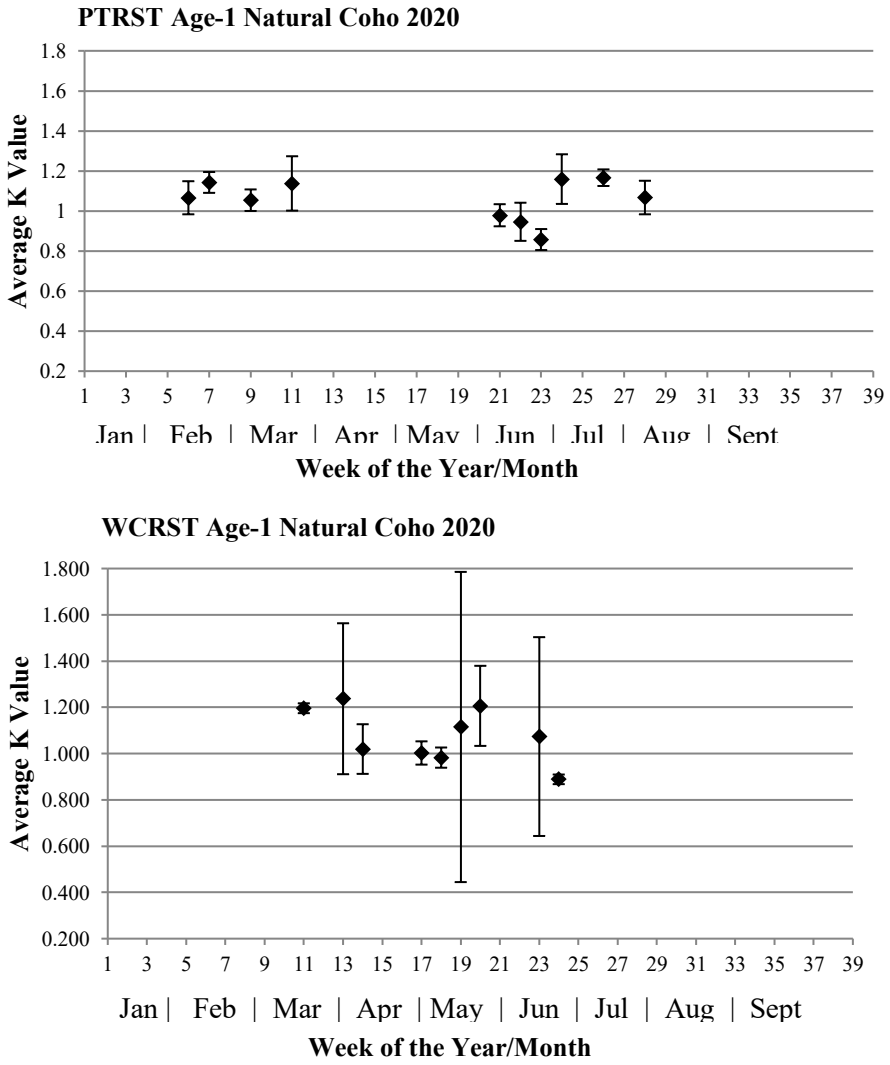
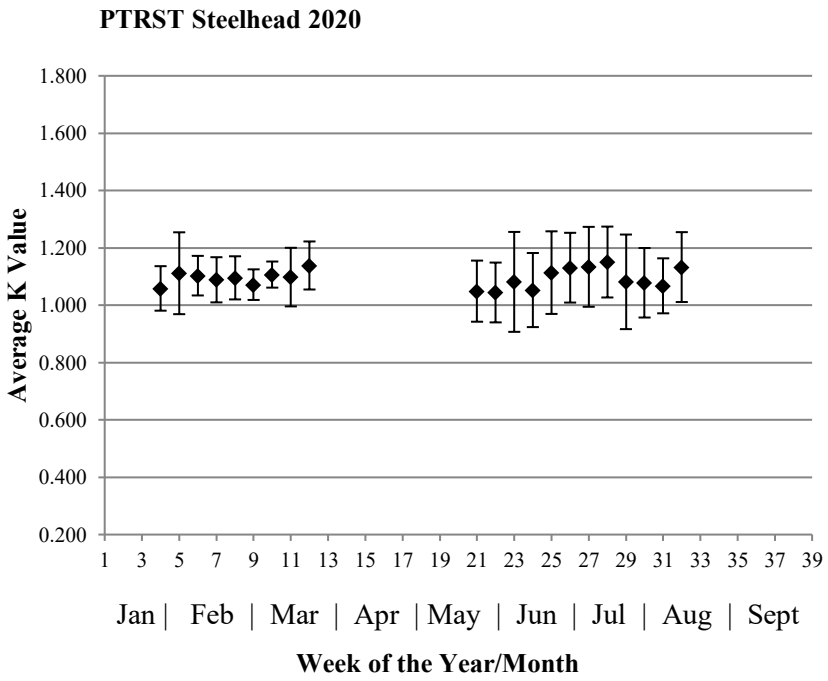


Figure 11. Weekly mean K value for natural age-1 Coho Salmon (*Oncorhynchus kisutch)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Error bars represent one standard deviation of the mean.



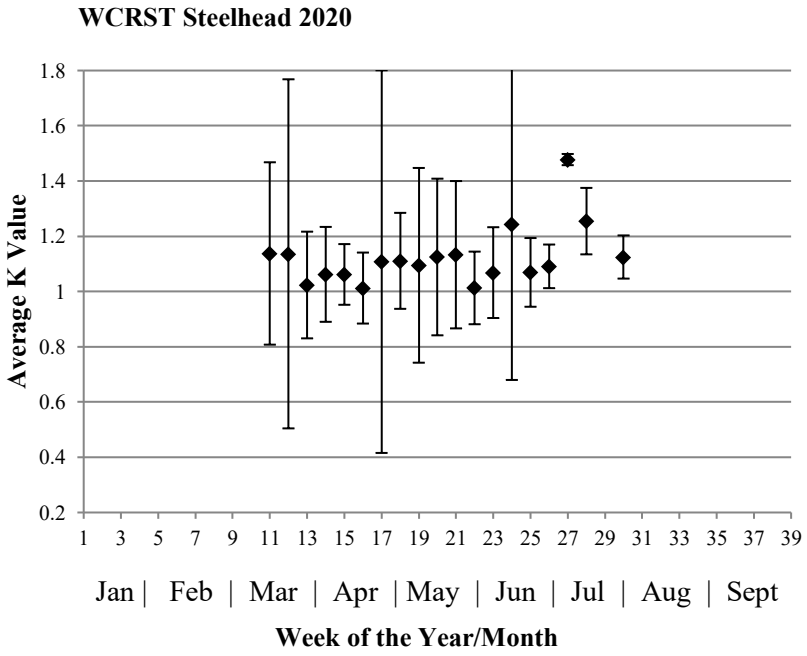


Figure 12. Weekly mean K value for natural age-1+ steelhead (*Oncorhynchus mykiss)* captured at Pear Tree Rotary Screw Trap (PTRST) and Willow Creek Rotary Screw Trap (WCRST), 2020. Error bars represent one standard deviation of the mean.

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Acknowledgements

Special thanks to Andreoli family, for allowing access through his property at the WCRST. In addition, the partners greatly appreciate the California Department of Fish and Wildlife and the Trinity River Hatchery staff for providing juvenile Chinook Salmon and facilitating mark-recapture efforts.

Appendices

Appendix 1. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Chinook Salmon catches and abundance indices, 2020. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge m^3/s	Trap Days Sampled	Weekly Chinook Salmon Catch						Weekly Chinook Salmon Index					
				Hatchery			Natural		Catch	Hatchery			Natural		Index
				NC	AD	Age-1	Age-0	Nat Age-1	Total	NC	AD	Age-1	Age-0	Age-1	Total
1/21/2020	3	16.8	5	---	0	0	118	2	120	0	0	0	1104	19	1123
1/28/2020	4	33.5	5	---	0	4	247	3	254	0	68	0	4189	51	4308
2/4/2020	5	25.6	4	---	0	10	207	52	269	0	161	0	3341	839	4341
2/11/2020	6	18.3	6	---	0	20	329	94	443	0	177	0	2902	829	3908
2/18/2020	7	16.2	5	---	0	3	680	38	721	0	31	0	7087	396	7514
2/25/2020	8	15.0	4	---	0	10	647	22	679	0	121	0	7850	267	8238
3/3/2020	9	14.7	5	---	0	10	772	37	819	0	111	0	8601	412	9124
3/10/2020	10	14.5	5	---	0	9	816	37	862	0	83	0	7530	341	7954
3/17/2020	11	14.3	5	---	0	11	529	57	597	0	111	0	5333	575	6019
3/24/2020	12	14.0	3	---	0	2	1286	19	1307	0	31	0	19891	294	20216
3/31/2020	13	14.1	---	---	---	---	---	---	---	---	---	---	---	---	---
4/7/2020	14	17.0	---	---	---	---	---	---	---	---	---	---	---	---	---
4/14/2020	15	20.7	---	---	---	---	---	---	---	---	---	---	---	---	---
4/21/2020	16	34.5	---	---	---	---	---	---	---	---	---	---	---	---	---
4/28/2020	17	69.7	---	---	---	---	---	---	---	---	---	---	---	---	---
5/5/2020	18	53.0	---	---	---	---	---	---	---	---	---	---	---	---	---
5/12/2020	19	41.4	---	---	---	---	---	---	---	---	---	---	---	---	---
5/19/2020	20	40.0	---	---	---	---	---	---	---	---	---	---	---	---	---
5/26/2020	21	35.2	5	---	0	1	6130	0	6131		17		104156	0	104173
6/2/2020	22	36.5	4	---	0	0	3044	0	3044	0	0	0	66983	0	66983
6/9/2020	23	29.8	5	---	0	0	3221	1	3222	0	0	0	45496	14	45510
6/16/2020	24	31.9	5	---	0	0	2377	0	2377	0	0	0	43157	0	43157
6/23/2020	25	27.6	5	---	0	0	1334	0	1334	0	0	0	18431	0	18431
6/30/2020	26	19.3	5	---	0	0	2024	1	2025	0	0	0	20659	10	20669
7/7/2020	27	15.4	3	---	0	0	881	0	881	0	0	0	13997	0	13997
7/14/2020	28	14.9	5	---	0	0	895	0	895	0	0	0	9018	0	9018
7/21/2020	29	14.5	5	---	0	0	398	0	398	0	0	0	4018	0	4018
7/28/2020	30	14.3	5	---	0	0	165	0	165	0	0	0	1653	0	1653
8/4/2020	31	14.1	5	---	0	0	97	0	97	0	0	0	887	0	887
8/11/2020	32	13.8	2	---	0	0	22	3	25	0	0	0	534	73	607
Totals			101	0	0	80	26219	366	26665	0	911	0	396817	4120	401848

Appendix 2. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook Salmon catches and abundance indices, 2020. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge	Trap Days Sampled	Weekly Chinook Salmon Catch						Weekly Chinook Salmon Index					
				Hatchery			Natural		Catch	Hatchery			Natural		Index
				NC	AD	Age-1	Age-0	Age-1	Total	NC	AD	Age-1	Age-0	Age-1	Total
3/12/2020	11	46.8	12	---	---	6	108	10	124	---	---	102	1,387	143	1,632
3/19/2020	12	46.5	12	---	---	10	92	17	119	---	---	97	1,396	233	1,726
3/26/2020	13	50.1	12	---	---	16	158	56	230	---	---	181	2,018	754	2,953
4/2/2020	14	81.6	12	---	---	4	128	26	158	---	---	52	1,148	213	1,414
4/9/2020	15	80.0	8	---	---	0	112	5	117	---	---	0	5,824	95	5,919
4/16/2020	16	83.2	12	---	---	0	830	6	836	---	---	13	10,130	121	10,264
4/23/2020	17	114.2	11	---	---	6	740	10	756	---	---	113	7,864	68	8,045
4/30/2020	18	92.3	12	---	---	6	140	3	149	---	---	60	15,491	45	15,597
5/7/2020	19	73.6	12	---	---	2	3,887	2	3891	---	---	68	39,283	97	39,448
5/14/2020	20	98.2	11	---	---	4	2,970	16	2990	---	---	20	39,089	160	39,269
5/21/2020	21	90.4	12	---	---	35	1,496	1	1532	---	---	541	21,560	15	22,116
5/28/2020	22	83.2	9	---	---	0	6,974	30	7004	---	---	18	155,002	539	155,559
6/4/2020	23	65.5	12	---	---	1	7,263	1	7265	---	---	0	97,622	11	97,633
6/11/2020	24	58.3	12	---	---	0	5,957	1	5958	---	---	0	72,672	0	72,672
6/18/2020	25	51.2	12	---	---	0	4,275	1	4276	---	---	0	33,959	0	33,959
6/25/2020	26	36.0	12	---	---	0	3,284	0	3284	---	---	0	34,950	9	34,960
7/2/2020	27	27.6	9	---	---	0	1,272	0	1272	---	---	0	8,612	0	8,612
7/9/2020	28	24.8	11	---	---	0	904	0	904	---	---	0	6,795	0	6,795
7/16/2020	29	22.2	11	---	---	0	158	0	158	---	---	0	1,184	0	1,184
7/23/2020	30	20.7	8	---	---	0	71	0	71	---	---	0	754	0	754
7/30/2020	31	19.1	8	---	---	4	21	0	25	---	---	16	30	0	46
Total				---	---	94	40,840	185	41,119	---	---	1,282	556,771	2,504	560,557

Appendix 3. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Coho Salmon catches and abundance indices, 2020. R-MAX = right maxillary clip.

	Week	Mean	Trap	Weekly Coho Salmon Catch				Weekly Coho Salmon Index			
Week	of	Daily	Days	Hatchery	Natural		Catch	Hatchery	Natural		Index
Starting	Year	Discharge	Sampled	R-MAX	Age-0	Age-1	Total	R-MAX	Age-0	Age-1	Total
1/21/2020	3	16.8	5	0	0	0	0	0	0	0	0
1/28/2020	4	33.5	5	0	0	1	1	0	0	17	17
2/4/2020	5	25.6	4	0	0	1	1	0	0	16	16
2/11/2020	6	18.3	6	0	0	5	5	0	0	44	44
2/18/2020	7	16.2	5	0	0	4	4	0	0	42	42
2/25/2020	8	15.0	4	0	0	1	1	0	0	12	12
3/3/2020	9	14.6	5	0	0	7	7	0	0	78	78
3/10/2020	10	14.4	5	0	0	0	0	0	0	0	0
3/17/2020	11	14.4	5	0	0	21	22	0	10	212	222
3/24/2020	12	13.9	3	0	0	0	0	0	0	0	0
3/31/2020	13	14.4	---	---	---	---	---	---	---	---	---
4/7/2020	14	17.4	---	---	---	---	---	---	---	---	---
4/14/2020	15	23.7	---	---	---	---	---	---	---	---	---
4/21/2020	16	34.2	---	---	---	---	---	---	---	---	---
4/28/2020	17	76.5	---	---	---	---	---	---	---	---	---
5/5/2020	18	49.4	---	---	---	---	---	---	---	---	---
5/12/2020	19	40.7	---	---	---	---	---	---	---	---	---
5/19/2020	20	39.8	---	---	---	---	---	---	---	---	---
5/26/2020	21	35.1	5	16	0	1	17	272	0	17	289
6/2/2020	22	36.0	4	9	2	0	11	198	44	0	242
6/9/2020	23	28.8	5	5	0	0	5	71	0	0	71
6/16/2020	24	33.5	5	1	8	0	9	18	145	0	163
6/23/2020	25	25.4	5	0	1	0	1	0	14	0	14
6/30/2020	26	18.5	5	0	7	0	7	0	71	0	71
7/7/2020	27	15.2	3	0	1	0	1	0	16	0	16
7/14/2020	28	14.9	5	0	3	0	3	0	30	0	30
7/21/2020	29	14.4	5	0	1	0	1	0	10	0	10
7/28/2020	30	14.3	5	0	0	0	0	0	0	0	0
8/4/2020	31	14.0	5	0	1	0	1	0	9	0	9
8/11/2020	32	13.8	2	0	0	0	0	0	0	0	0
Total			91	31	24	41	97	559	349	438	1,346

Appendix 4. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Coho Salmon catches and abundance indices, 2020. R-MAX = right maxillary clip.

Week Starting	Week of Year	Mean Daily Discharge	Trap Days Sampled	Weekly Coho Salmon Catch				Weekly Coho Salmon Index			
				Hatchery	Natural		Catch	Hatchery	Natural		Index
				R-MAX	Age-0	Age-1	Total	R-MAX	Age-0	Age-1	Total
3/12/2020	11	46.8	12	0	0	2	2	0	0	21	21
3/19/2020	12	46.5	12	0	1	0	1	0	12	0	12
3/26/2020	13	50.1	12	119	1	9	129	1,310	12	150	1,472
4/2/2020	14	81.6	12	94	0	4	98	289	0	13	302
4/9/2020	15	80.0	8	10	0	0	10	248	0	14	261
4/16/2020	16	83.2	12	60	1	1	62	0	13	0	13
4/23/2020	17	114.2	11	18	0	3	21	71	32	43	145
4/30/2020	18	92.3	12	4	2	2	8	29	13	30	73
5/7/2020	19	73.6	12	34	3	3	40	483	24	49	555
5/14/2020	20	98.2	11	91	2	4	97	749	52	51	853
5/21/2020	21	90.4	12	56	6	1	63	0	53	0	53
5/28/2020	22	83.2	9	27	7	1	35	174	244	88	506
6/4/2020	23	65.5	12	7	14	4	25	0	148	0	148
6/11/2020	24	58.3	12	4	17	2	23	22	164	22	208
6/18/2020	25	51.2	12	0	5	0	5	0	31	0	31
6/25/2020	26	36.0	12	0	1	1	2	0	34	9	43
7/2/2020	27	27.6	9	0	3	0	3	0	9	0	9
7/9/2020	28	24.8	11	0	2	0	2	0	7	0	7
7/16/2020	29	22.2	11	0	0	0	0	0	0	0	0
7/23/2020	30	20.7	8	0	0	0	0	0	0	0	0
7/30/2020	31	19.1	8	0	0	0	0	0	0	0	0
Total				524	65	37	626	3,375	849	489	4,713

Appendix 5. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly steelhead catches and abundance indices, 2020. AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge m^3/s	Trap Days Sampled	Weekly Steelhead Catch					Weekly Steelhead Index				
				Hatchery	Natural			Catch	Hatchery	Natural			Index
				AD	Age-0	Age-1	Age-2+	Total	AD	Age-0	Age-1	Age-2+	Total
1/21/2020	3	16.8	5	0	0	2	0	2	0	0	19	0	19
1/28/2020	4	33.5	5	0	0	8	0	8	0	0	136	0	136
2/4/2020	5	25.6	4	0	1	54	0	55	0	16	872	0	888
2/11/2020	6	18.3	6	0	0	14	0	14	0	0	123	0	123
2/18/2020	7	16.2	5	0	0	5	0	5	0	0	52	0	52
2/25/2020	8	15.0	4	0	1	8	0	9	0	12	97	0	109
3/3/2020	9	14.6	5	0	0	10	0	10	0	0	111	0	111
3/10/2020	10	14.4	5	0	0	15	0	15	0	0	138	0	138
3/17/2020	11	14.4	5	0	2	66	0	68	0	20	665	0	685
3/24/2020	12	13.9	3	0	0	29	0	29	0	0	449	0	449
3/31/2020	13	14.4	---	---	---	---	---	---	---	---	---	---	---
4/7/2020	14	17.4	---	---	---	---	---	---	---	---	---	---	---
4/14/2020	15	23.7	---	---	---	---	---	---	---	---	---	---	---
4/21/2020	16	34.2	---	---	---	---	---	---	---	---	---	---	---
4/28/2020	17	76.5	---	---	---	---	---	---	---	---	---	---	---
5/5/2020	18	49.4	---	---	---	---	---	---	---	---	---	---	---
5/12/2020	19	40.7	---	---	---	---	---	---	---	---	---	---	---
5/19/2020	20	39.8	---	---	---	---	---	---	---	---	---	---	---
5/26/2020	21	35.1	5	18	73	61	0	152	306	1240	1036	0	2582
6/2/2020	22	36.0	4	1	92	28	0	121	22	2024	616	0	2662
6/9/2020	23	28.8	5	1	32	26	0	59	14	452	367	0	833
6/16/2020	24	33.5	5	1	402	24	0	427	18	7299	436	0	7753
6/23/2020	25	25.4	5	2	302	18	0	322	28	4173	249	0	4450
6/30/2020	26	18.5	5	1	326	16	0	343	10	3328	163	0	3501
7/7/2020	27	15.2	3	0	64	3	0	67	0	1017	48	0	1065
7/14/2020	28	14.9	5	0	128	7	0	135	0	1290	71	0	1361
7/21/2020	29	14.4	5	0	199	14	0	213	0	2009	141	0	2150
7/28/2020	30	14.3	5	0	108	16	0	124	0	1082	160	0	1242
8/4/2020	31	14.0	5	0	37	5	0	42	0	338	46	0	384
8/11/2020	32	13.8	2	0	19	1	0	20	0	461	24	0	485
Total			101	24	1,786	430	0	2,240	398	24,761	6,019	0	31,178

Appendix 6. Trinity River at Willow Creek Rotary crew Trap site (WCRST) weekly steelhead catches and abundance indices, 2020. AD = adipose fin clip.

Week Starting	Week of Year	Mean Daily Discharge	Trap Days Sampled	Weekly Steelhead Catch				Weekly Steelhead Index				
				Hatchery	Natural		Catch	Hatchery	Natural			Index
				AD	Age-0	Age-1	Total	AD	Age-0	Age-1	Age-2+	Total
3/12/2020	11	46.8	12	2	11	4	17	21	0	119	---	140
3/19/2020	12	46.5	12	0	13	38	51	0	0	526	---	526
3/26/2020	13	50.1	12	0	27	71	98	0	149	1,052	---	1,201
4/2/2020	14	81.6	12	1	623	260	884	13	47	3,131	---	3,192
4/9/2020	15	80.0	8	0	191	84	275	0	0	2,418	---	2,418
4/16/2020	16	83.2	12	0	229	229	458	13	280	2,776	---	3,069
4/23/2020	17	114.2	11	79	101	178	358	1,788	401	1,618	---	3,807
4/30/2020	18	92.3	12	75	17	32	124	972	229	923	---	2,124
5/7/2020	19	73.6	12	58	88	134	280	1,154	383	1,798	---	3,335
5/14/2020	20	98.2	11	87	28	153	268	903	677	2,191	---	3,771
5/21/2020	21	90.4	12	32	13	74	119	277	305	530	---	1,112
5/28/2020	22	83.2	9	13	50	15	78	240	868	417	---	1,525
6/4/2020	23	65.5	12	4	49	16	69	61	1,217	158	---	1,436
6/11/2020	24	58.3	12	3	67	8	78	13	326	69	---	408
6/18/2020	25	51.2	12	1	88	6	95	11	114	33	---	158
6/25/2020	26	36.0	12	0	69	2	71	0	154	18	---	172
7/2/2020	27	27.6	9	0	19	2	21	0	226	36	---	262
7/9/2020	28	24.8	11	0	13	3	16	0	44	10	---	54
7/16/2020	29	22.2	11	0	24	0	24	0	40	0	---	40
7/23/2020	30	20.7	8	0	17	4	21	0	44	46	---	90
7/30/2020	31	19.1	8	0	29	1	30	46	77	4	---	127
Totals			230	355	1,766	1,314	3,367	5,514	5,581	17,874	---	28,968

Appendix 7. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly age-0 Chinook Salmon population estimate input and results, 2020. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Sampling Fraction[1]	Catch NC	Catch AD	Marks Released	Marks Recaptured	Recapture Rate	Estimated Chinook	Estimated Chinook Lower Bound	Estimated Chinook Upper Bound
1/21/2020	3	0.71	120	0	0	0	0	12235	5617	22372
1/28/2020	4	0.71	250	4	0	0	0	19014	9211	31713
2/4/2020	5	0.57	259	10	0	0	0	21709	11187	35552
2/11/2020	6	0.86	423	20	0	0	0	25936	13124	44223
2/18/2020	7	0.71	718	3	0	0	0	49738	26982	83148
2/25/2020	8	0.57	669	10	0	0	0	63175	32674	106246
3/3/2020	9	0.71	809	10	0	0	0	64810	34298	106229
3/10/2020	10	0.71	853	9	0	0	0	65545	34791	110137
3/17/2020	11	0.71	586	11	0	0	0	58475	29255	105219
3/24/2020	12	0.43	1,305	2	0	0	0	145107	71815	247256
3/31/2020	13	0	---	---	---	---	---	161114	24909	473512
4/7/2020	14	0	---	---	---	---	---	183708	8003	720360
4/14/2020	15	0	---	---	---	---	---	205597	8684	946671
4/21/2020	16	0	---	---	---	---	---	230758	7962	1129719
4/28/2020	17	0	---	---	---	---	---	264549	12109	1249833
5/5/2020	18	0	---	---	---	---	---	298767	13537	1318304
5/12/2020	19	0	---	---	---	---	---	344025	21123	1327111
5/19/2020	20	0	---	---	---	---	---	387003	66420	1101881
5/26/2020	21	0.71	6,130	1	2409	102	0.04	439704	218025	741167
6/2/2020	22	0.57	3,044	0	2334	205	0.09	301037	232078	392041
6/9/2020	23	0.71	3,222	0	2489	166	0.07	244159	188007	313951
6/16/2020	24	0.71	2,377	0	2395	66	0.03	189169	142137	237267
6/23/2020	25	0.71	1,334	0	2477	185	0.07	112964	84439	144603
6/30/2020	26	0.71	2,025	0	2006	204	0.10	109841	87272	135520
7/7/2020	27	0.43	881	0	1098	86	0.08	197385	135682	288494
7/14/2020	28	0.71	895	0	2490	119	0.05	46169	32836	61877
7/21/2020	29	0.71	398	0	2531	113	0.04	38331	28792	49753
7/28/2020	30	0.71	165	0	2494	159	0.06	17014	11934	22628
8/4/2020	31	0.71	97	0	0	0	0	9190	6416	12619
8/11/2020	32	0.29	25	0	0	0	0	5575	2507	10281
Total		0.71	26,585	80	22,723	1,405	0.1	4,311,803	1,601,826	11,569,688

[1] Fraction of possible trap days successfully sampled

Appendix 8. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly age-0 Chinook Salmon population estimate input and results, 2020. NC = no clip, AD = adipose fin clip.

Week Starting	Week of Year	Sampling Fraction[1]	Catch NC	Catch AD	Marks Released	Marks Recaptured	Recapture Rate	Estimated Chinook	Estimated Chinook Lower Bound	Estimated Chinook Upper Bound
3/12/2020	11	0.57	90	0	0	0	---	11,376	518	46,752
3/19/2020	12	0.57	92	0	0	0	---	9,948	880	39,107
3/26/2020	13	0.57	131	0	0	0	---	12,518	937	47,435
4/2/2020	14	0.57	113	0	0	0	---	12,486	934	50,666
4/9/2020	15	0.29	102	0	2338	4	0.00	18,158	1,398	68,130
4/16/2020	16	0.57	783	0	1809	113	0.06	22,282	18,255	26,804
4/23/2020	17	0.57	741	0	2198	49	0.02	57,803	42,310	75,298
4/30/2020	18	0.57	132	0	4878	70	0.01	16,501	12,211	21,349
5/7/2020	19	0.57	3836	0	0	0	---	180,402	18,057	648,534
5/14/2020	20	0.57	2872	0	7143	250	0.03	144,089	126,737	163,573
5/21/2020	21	0.57	1470	0	6912	160	0.02	28,319	23,351	33,782
5/28/2020	22	0.14	6951	0	6735	154	0.02	2,114,593	1,807,882	2,466,682
6/4/2020	23	0.29	7202	0	7356	31	0.00	5,551,895	3,858,347	7,576,885
6/11/2020	24	0.57	5892	0	3386	36	0.01	969,673	692,646	1,322,991
6/18/2020	25	0.57	4164	0	3782	52	0.01	536,281	404,936	695,123
6/25/2020	26	0.57	3243	0	5175	19	0.00	1,355,799	881,234	1,946,880
7/2/2020	27	0.43	1252	0	2940	77	0.03	112,748	90,067	140,828
7/9/2020	28	0.57	852	0	3046	175	0.06	26,369	22,454	30,717
7/16/2020	29	0.57	140	0	1748	2	0.00	78,538	32,967	168,744
7/23/2020	30	0.57	54	0	4022	145	0.04	2,692	1,915	3,603
7/30/2020	31	0.57	14	0	0	0	---	1,557	70	6,867
Total			52,029	7,903	38,037	2,891	0.08	11,264,028	8,038,108	15,580,749

[1] Fraction of possible trap days successfully sampled each week

Appendix 9. Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly Chinook and Coho salmon fork lengths, 2020.

		Chinook Salmon[1]										Natural Coho Salmon										Hatchery Coho Salmon				
Week	Week of	Age-0					Age-1					Age-0					Age-1					Age-1				
Starting	Year	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
1/21/2020	3	118	35.1	32	39	1.51	2	96.5	96	97	0.7	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
1/28/2020	4	251	39.5	31	160	15.08	3	94.3	83	100	9.81	0	--	--	--	--	1	144.0	144	144	NA	0	--	--	--	--
2/4/2020	5	214	51.1	33	110	16.45	55	100.5	84	122	9.17	0	--	--	--	--	1	105.0	105	105	NA	0	--	--	--	--
2/11/2020	6	331	37.4	31	107	7.32	112	100.6	79	116	8.10	0	--	--	--	--	5	108.2	91	123	11.45	0	--	--	--	--
2/18/2020	7	683	38.4	32	103	9.38	38	101.4	90	122	8.00	0	--	--	--	--	4	137.8	98	187	37.83	0	--	--	--	--
2/25/2020	8	657	42.9	33	125	18.93	22	95.6	85	114	7.49	0	--	--	--	--	1	103.0	103	103	NA	0	--	--	--	--
3/3/2020	9	782	43.1	30	112	15.00	37	99.1	58	125	13.66	0	--	--	--	--	7	106.1	134	134	20.72	0	--	--	--	--
3/10/2020	10	825	43.0	32	115	16.52	37	978.0	76	115	9.00	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
3/17/2020	11	540	53.7	34	114	15.47	57	101.7	81	125	9.79	1	--	--	--	--	21	113.4	171	171	19.02	0	--	--	--	--
3/24/2020	12	1288	50.1	32	98	11.81	19	703.4	88	119	8.19	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
3/31/2020	13	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/7/2020	14	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/14/2020	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/21/2020	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4/28/2020	17	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/5/2020	18	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/12/2020	19	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/19/2020	20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
5/26/2020	21	6131	68.8	32	100	11.88	0	--	--	--	--	0	--	--	--	--	1	126.0	126	126	NA	16	160.9	140	177	12.58
6/2/2020	22	3044	74.1	55	92	7.31	0	--	--	--	--	2	71.0	68	74	4.24	0	--	--	--	--	9	145.9	139	156	5.78
6/9/2020	23	3221	74.8	52	95	8.37	1	171.0	171	171	NA	0	--	--	--	--	0	--	--	--	--	5	141.8	138	146	3.63
6/16/2020	24	2377	75.2	44	104	11.35	0	--	--	--	--	8	70.8	65	80	4.59	0	--	--	--	--	1	161.0	161	161	NA
6/23/2020	25	1334	77.3	34	115	11.07	0	--	--	--	--	1	77.0	77	77	--	0	--	--	--	--	0	--	--	--	--
6/30/2020	26	2024	80.8	41	102	10.54	1	169.0	169	169	NA	7	73.7	68	80	3.82	0	--	--	--	--	0	--	--	--	--
7/7/2020	27	881	61.7	45	101	8.97	0	--	--	--	--	1	72.0	72	72	--	0	--	--	--	--	0	--	--	--	--
7/14/2020	28	895	61.6	54	105	9.01	0	--	--	--	--	3	87.7	78	101	11.93	0	--	--	--	--	0	--	--	--	--
7/21/2020	29	398	81.8	56	112	8.76	0	--	--	--	--	1	75.0	75	75	--	0	--	--	--	--	0	--	--	--	--
7/28/2020	30	165	82.6	40	112	11.05	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
8/4/2020	31	97	86.2	41	118	9.52	0	--	--	--	--	1	72.0	72	72	--	0	--	--	--	--	0	--	--	--	--
8/11/2020	32	22	83.4	69	103	7.15	3	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--

[1]Natural and Hatchery combined

Appendix 10. Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly Chinook and Coho salmon fork lengths, 2020.

		Chinook Salmon[1]										Natural Coho Salmon										Hatchery Coho Salmon					
Week	Week of	Age-0					Age-1					Age-0					Age-1					Age-1					
Starting	Year	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	
3/12/2020	11	111	42.5	31	99	13.84	13	111.3	102	130	8.16	---	---	---	---	---	2	154.0	153	155	1.41	---	---	---	---	---	
3/19/2020	12	94	53.7	31	106	19.63	25	112.1	100	148	10.32	1	36.0	36	36	NA	---	---	---	---	---	---	---	---	---	---	
3/26/2020	13	151	53.1	32	107	15.87	72	115.5	100	170	10.39	---	---	---	---	---	9	150.9	127	171	16.85	119	153.6	122	198	13.61	
4/2/2020	14	115	57.1	33	98	15.75	28	112.1	100	137	10.73	---	---	---	---	---	4	156.0	140	181	18.31	94	156.2	122	200	14.17	
4/9/2020	15	90	58.4	34	154	18.62	5	113.0	107	122	6.00	---	---	---	---	---	---	---	---	---	---	10	157.5	132	174	13.15	
4/16/2020	16	240	62.7	35	128	11.78	6	129.5	113	160	16.65	1	51.0	51	51	NA	1	202.0	202	202	NA	60	170.8	135	258	20.93	
4/23/2020	17	214	67.2	27	150	17.49	12	130.5	112	155	13.37	---	---	---	---	---	3	166.0	158	170	6.93	17	160.5	120	205	21.56	
4/30/2020	18	107	73.6	48	135	16.86	4	140.3	67	220	63.92	2	58.0	51	65	9.90	2	143.5	134	153	13.44	4	167.3	144	190	20.65	
5/7/2020	19	353	76.2	37	180	13.82	2	116.0	115	117	1.41	3	51.0	49	54	2.65	3	151.7	121	178	28.75	34	155.8	133	193	14.59	
5/14/2020	20	316	79.0	47	107	11.12	19	115.0	71	207	32.85	2	60.0	56	64	5.66	4	105.8	74	125	22.77	91	156.6	131	211	12.71	
5/21/2020	21	241	80.7	53	115	12.33	1	82.0	82	82	NA	6	57.8	44	77	10.82	1	125.0	125	125	NA	55	151.7	131	179	11.24	
5/28/2020	22	238	87.5	42	117	10.35	30	84.2	70	98	7.10	7	63.6	55	77	8.48	1	140.0	140	140	NA	27	153.4	130	180	13.14	
6/4/2020	23	330	85.4	52	117	8.20	1	95.0	95	95	NA	14	63.7	55	79	6.34	4	156.5	125	190	27.45	7	148.4	120	175	17.29	
6/11/2020	24	389	85.7	62	105	6.85	1	100.0	100	100	NA	17	63.3	53	73	6.22	2	158.0	156	160	2.83	4	137.3	131	141	4.79	
6/18/2020	25	358	84.4	55	115	7.48	---	---	---	---	---	5	69.4	54	80	10.95	---	---	---	---	---	---	---	---	---	---	
6/25/2020	26	299	84.0	65	102	6.33	1	107.0	107	107	NA	1	80.0	80	80	NA	1	139.0	139	139	NA	---	---	---	---	---	
7/2/2020	27	231	80.3	58	97	7.15	---	---	---	---	---	3	67.7	66	71	2.89	---	---	---	---	---	---	---	---	---	---	
7/9/2020	28	304	81.1	62	98	6.44	---	---	---	---	---	2	66.0	61	71	7.07	---	---	---	---	---	---	---	---	---	---	
7/16/2020	29	127	79.7	60	91	6.50	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
7/23/2020	30	49	78.8	55	94	8.26	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	
7/30/2020	31	16	78.9	49	89	9.83	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	

[1]Natural and Hatchery combined.

Appendix 11: Trinity River at Pear Tree Rotary Screw Trap site (PTRST) weekly steelhead fork lengths, 2020.

		Natural Steelhead										Hatchery Steelhead				
Week	Week of	Age-0					Age-1					Age-1				
Starting	Year	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD
3/12/2020	11	11	84.9	32	99	19.45	4	159.8	101	239	68.96	2	168.0	161	175	9.90
3/19/2020	12	13	87.0	75	98	9.27	38	165.2	100	239	44.18	---	---	---	---	---
3/26/2020	13	27	89.2	74	99	7.26	71	173.3	100	285	48.05	---	---	---	---	---
4/2/2020	14	121	89.1	65	99	7.66	218	144.1	98	291	39.70	1	270.0	270	270	NA
4/9/2020	15	81	88.2	34	99	9.52	84	139.5	100	225	36.88	---	---	---	---	---
4/16/2020	16	143	89.1	54	99	7.84	227	151.7	100	265	40.64	---	---	---	---	---
4/23/2020	17	76	87.9	24	98	9.55	176	155.6	100	234	38.35	76	208.6	110	317	26.63
4/30/2020	18	13	89.7	73	98	7.55	30	161.5	100	300	45.26	75	208.8	182	250	14.75
5/7/2020	19	87	89.9	66	99	6.62	134	150.0	100	222	32.56	58	191.5	119	240	29.00
5/14/2020	20	27	91.8	84	99	4.25	153	159.9	100	232	27.18	87	194.2	136	240	19.01
5/21/2020	21	13	94.6	80	99	5.17	74	155.2	102	220	26.98	32	176.9	128	220	23.25
5/28/2020	22	25	54.8	38	96	17.31	15	157.5	132	177	14.99	13	183.8	138	230	30.77
6/4/2020	23	45	55.6	41	89	9.81	16	151.8	100	210	31.81	4	193.0	170	217	20.15
6/11/2020	24	65	52.9	28	71	7.85	8	146.3	110	188	28.68	3	207.3	180	225	24.01
6/18/2020	25	88	54.6	27	73	7.83	6	140.8	110	190	36.89	1	200.0	200	200	NA
6/25/2020	26	63	65.8	35	97	16.95	2	156.0	125	187	43.84	---	---	---	---	---
7/2/2020	27	19	54.8	34	66	8.00	2	117.5	96	139	30.41	---	---	---	---	---
7/9/2020	28	13	56.3	41	75	9.34	3	133.0	121	151	15.87	---	---	---	---	---
7/16/2020	29	24	43.6	35	50	4.27	---	---	---	---	---	---	---	---	---	---
7/23/2020	30	8	49.3	40	63	6.58	4	120.0	110	135	10.80	---	---	---	---	---
7/30/2020	31	15	53.3	39	87	17.09	---	---	---	---	---	---	---	---	---	---

Appendix 12: Trinity River at Willow Creek Rotary Screw Trap site (WCRST) weekly steelhead fork lengths, 2020.

		Natural Steelhead										Hatchery Steelhead					
Week	Week of	Age-0					Age-1					Age-1					
Starting	Year	n	mean	min	max	SD	n	mean	min	max	SD	n	mean	min	max	SD	
3/12/2020	11	11	84.9	32	99	19.45	4	159.8	101	239	68.96	2	168.0	161	175	9.90	
3/19/2020	12	13	87.0	75	98	9.27	38	165.2	100	239	44.18	---	---	---	---	---	
3/26/2020	13	27	89.2	74	99	7.26	71	173.3	100	285	48.05	---	---	---	---	---	
4/2/2020	14	121	89.1	65	99	7.66	218	144.1	98	291	39.70	1	270.0	270	270	NA	
4/9/2020	15	81	88.2	34	99	9.52	84	139.5	100	225	36.88	---	---	---	---	---	
4/16/2020	16	143	89.1	54	99	7.84	227	151.7	100	265	40.64	---	---	---	---	---	
4/23/2020	17	76	87.9	24	98	9.55	176	155.6	100	234	38.35	76	208.6	110	317	26.63	
4/30/2020	18	13	89.7	73	98	7.55	30	161.5	100	300	45.26	75	208.8	182	250	14.75	
5/7/2020	19	87	89.9	66	99	6.62	134	150.0	100	222	32.56	58	191.5	119	240	29.00	
5/14/2020	20	27	91.8	84	99	4.25	153	159.9	100	232	27.18	87	194.2	136	240	19.01	
5/21/2020	21	13	94.6	80	99	5.17	74	155.2	102	220	26.98	32	176.9	128	220	23.25	
5/28/2020	22	25	54.8	38	96	17.31	15	157.5	132	177	14.99	13	183.8	138	230	30.77	
6/4/2020	23	45	55.6	41	89	9.81	16	151.8	100	210	31.81	4	193.0	170	217	20.15	
6/11/2020	24	65	52.9	28	71	7.85	8	146.3	110	188	28.68	3	207.3	180	225	24.01	
6/18/2020	25	88	54.6	27	73	7.83	6	140.8	110	190	36.89	1	200.0	200	200	NA	
6/25/2020	26	63	65.8	35	97	16.95	2	156.0	125	187	43.84	---	---	---	---	---	
7/2/2020	27	19	54.8	34	66	8.00	2	117.5	96	139	30.41	---	---	---	---	---	
7/9/2020	28	13	56.3	41	75	9.34	3	133.0	121	151	15.87	---	---	---	---	---	
7/16/2020	29	24	43.6	35	50	4.27	---	---	---	---	---	---	---	---	---	---	
7/23/2020	30	8	49.3	40	63	6.58	4	120.0	110	135	10.80	---	---	---	---	---	
7/30/2020	31	15	53.3	39	87	17.09	---	---	---	---	---	---	---	---	---	---	

Appendix 13. Fulton's condition factor (K) for pooled natural and hatchery age-0 Chinook Salmon with FL > 50 mm from the Pear Tree and Willow Creek Rotary Screw Trap sites, 2020.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	SD	n	Average K	SD
1/28/2020	3	---	---	---	---	---	---
2/4/2020	4	8	1.020	0.078	---	---	---
2/11/2020	5	62	1.066	0.087	---	---	---
2/18/2020	6	114	1.069	0.063	---	---	---
2/25/2020	7	42	1.043	0.064	---	---	---
3/3/2020	8	36	1.021	0.080	---	---	---
3/10/2020	9	47	1.025	0.064	---	---	---
3/17/2020	10	52	1.054	0.052	---	---	---
3/24/2020	11	99	1.055	0.086	111	0.987	0.056
3/31/2020	12	56	1.074	0.089	94	1.064	0.172
4/7/2020	13	---	---	---	151	1.106	0.245
4/14/2020	14	---	---	---	115	1.092	0.225
4/21/2020	15	---	---	---	90	1.112	0.324
4/28/2020	16	---	---	---	240	1.153	0.180
5/5/2020	17	---	---	---	214	1.310	1.044
5/12/2020	18	---	---	---	107	1.179	0.253
5/19/2020	19	---	---	---	353	1.292	0.315
5/26/2020	20	---	---	---	316	1.238	0.241
6/2/2020	21	143	1.077	0.084	241	1.186	0.576
6/9/2020	22	120	1.088	0.074	238	1.130	0.317
6/16/2020	23	121	1.096	0.073	330	1.207	0.345
6/23/2020	24	146	1.082	0.092	389	1.179	0.165
6/30/2020	25	149	1.111	0.091	358	1.180	1.050
7/7/2020	26	148	1.082	0.077	299	1.180	0.523
7/14/2020	27	89	1.066	0.079	231	1.185	0.204
7/21/2020	28	150	1.122	0.123	304	1.180	0.168
7/28/2020	29	149	1.110	0.091	127	1.197	0.197
8/4/2020	30	138	1.056	0.070	49	1.135	0.106
8/11/2020	31	85	1.028	0.071	16	1.104	0.046
8/18/2020	32	22	1.013	0.032	---	---	---

Appendix 14. Fulton's condition factor (K) for natural age-1 Coho Salmon from the Pear Tree and Willow Creek Rotary Screw Trap sites, 2020.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	SD	n	Average K	SD
1/28/2020	3	---	---	---	---	---	---
2/4/2020	4	---	---	NA	---	---	---
2/11/2020	5	---	---	NA	---	---	---
2/18/2020	6	5	1.066	0.083	---	---	---
2/25/2020	7	4	1.143	0.052	---	---	---
3/3/2020	8	---	---	NA	---	---	---
3/10/2020	9	7	1.054	0.054	---	---	---
3/17/2020	10	---	---	---	---	---	---
3/24/2020	11	21	1.138	0.136	2	1.196	0.021
3/31/2020	12	---	---	---	---	---	---
4/7/2020	13	---	---	---	9	1.237	0.326
4/14/2020	14	---	---	---	4	1.020	0.107
4/21/2020	15	---	---	---	---	---	---
4/28/2020	16	---	---	---	---	---	---
5/5/2020	17	---	---	---	3	1.003	0.050
5/12/2020	18	---	---	---	2	0.983	0.044
5/19/2020	19	---	---	---	3	1.115	0.671
5/26/2020	20	---	---	---	4	1.206	0.173
6/2/2020	21	13	0.979	0.055	---	---	---
6/9/2020	22	11	0.946	0.095	---	---	---
6/16/2020	23	5	0.857	0.053	4	1.074	0.430
6/23/2020	24	9	1.159	0.124	2	0.889	0.021
6/30/2020	25	---	---	NA	---	---	---
7/7/2020	26	7	1.166	0.041	---	---	---
7/14/2020	27	---	---	---	---	---	---
7/21/2020	28	3	1.067	0.084	---	---	---
7/28/2020	29	---	---	---	---	---	---
8/4/2020	30	---	---	---	---	---	---
8/11/2020	31	---	---	---	---	---	---
8/18/2020	32	---	---	---	---	---	---

Appendix 15. Fulton's condition factor (K) for natural age-1+ steelhead from the Pear Tree and Willow Creek Rotary Screw Trap sites, 2020.

Week Starting	Week of Year	Pear Tree Trap Site			Willow Creek Trap Site		
		n	Average K	SD	n	Average K	SD
1/28/2020	3	---	---	---	---	---	---
2/4/2020	4	8	1.059	0.078	---	---	---
2/11/2020	5	53	1.111	0.143	---	---	---
2/18/2020	6	14	1.103	0.069	---	---	---
2/25/2020	7	5	1.089	0.079	---	---	---
3/3/2020	8	8	1.095	0.075	---	---	---
3/10/2020	9	6	1.072	0.053	---	---	---
3/17/2020	10	15	1.107	0.046	---	---	---
3/24/2020	11	66	1.098	0.102	4	1.138	0.330
3/31/2020	12	29	1.139	0.084	38	1.136	0.632
4/7/2020	13	---	---	---	71	1.024	0.193
4/14/2020	14	---	---	---	218	1.062	0.172
4/21/2020	15	---	---	---	84	1.062	0.110
4/28/2020	16	---	---	---	227	1.012	0.128
5/5/2020	17	---	---	---	176	1.108	0.693
5/12/2020	18	---	---	---	30	1.111	0.174
5/19/2020	19	---	---	---	134	1.095	0.353
5/26/2020	20	---	---	---	153	1.125	0.284
6/2/2020	21	65	1.049	0.107	74	1.133	0.267
6/9/2020	22	30	1.044	0.104	15	1.013	0.131
6/16/2020	23	37	1.081	0.174	16	1.068	0.164
6/23/2020	24	64	1.053	0.129	8	1.244	0.565
6/30/2020	25	92	1.114	0.144	6	1.069	0.124
7/7/2020	26	87	1.131	0.122	2	1.091	0.079
7/14/2020	27	42	1.134	0.139	2	1.478	0.020
7/21/2020	28	107	1.151	0.124	3	1.255	0.120
7/28/2020	29	93	1.081	0.165	---	---	---
8/4/2020	30	82	1.078	0.121	4	1.125	0.078
8/11/2020	31	31	1.068	0.096	---	---	---
8/18/2020	32	18	1.133	0.122	---	---	---