

Summary Of Catch And Biological Data Collected During Juvenile Salmonid Monitoring On The Mainstem Klamath River Below Iron Gate Dam, California, 2017

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Abstract.— This report summarizes results from the 2017 season of juvenile salmonid outmigrant monitoring on the mainstem Klamath River below Iron Gate Dam. Trapping occurred at three locations: below the confluence with Bogus Creek (river km 308), near where Interstate 5 crosses the Klamath River (river km 294), and near the Kinsman Creek confluence upstream of the confluence with the Scott River (river km 238). High and variable river flows throughout much of the trapping season prevented the continual operation of traps, contributed to flawed sets at all three trap sites that precluded estimates of abundance, and likely contributed to the overall low catches observed relative to other years. Both frame nets and rotary screw traps were used to sample juvenile salmonids and other fishes. Traps were deployed in late February (Bogus trap site), early March (I-5 trap site), and early June (Kinsman trap site) and were operated until late May (Bogus and I-5 trap sites), or late June (Kinsman trap site). Juvenile salmonids were enumerated daily when traps were operating and subsamples of salmonids were measured for length, weight, and external symptoms of disease. Non-salmonid fishes were also enumerated and subsampled for length measurements. Natural-origin age-0 Chinook Salmon were captured at each of the three trap sites in all weeks that sampling occurred and displayed few external symptoms of disease. Natural-origin juvenile Coho Salmon and steelhead were also observed in relatively low numbers at all three sites during the trapping season.

Introduction

The Klamath River basin historically supported large runs of Chinook Salmon (*Oncorhynchus tshawytscha*), Coho Salmon (*O. kisutch*), steelhead (*O. mykiss*), and other anadromous fishes (KRBFTF 1991; NAS 2004; USDOJ and NMFS 2012). These species contribute to economically and culturally important subsistence, sport, and commercial fisheries. However, abundances of anadromous fish species have declined dramatically due to a variety of factors, including overfishing, logging, mining, road building, livestock grazing, water diversion, wetland conversion, and dam construction (KRBFTF 1991; NAS 2004; USDOJ and NMFS 2012).

The U.S. Fish and Wildlife Service (USFWS), in collaboration with the Karuk Tribe and U.S. Geological Survey (USGS), began trapping juvenile salmonids on the Klamath River between Iron Gate Dam and the Scott River confluence in 2000 to collect outmigration timing data and relative weekly numbers for the calibration of a young-of-the-year (age-0) Chinook Salmon production model, SALMOD (Bartholow et al. 2002). Beginning in 2006, the objectives of this ongoing monitoring project were directed towards generating estimates of production (Gough et al. 2015) and prevalence of disease (Nichols and True 2007; Nichols et al. 2009; True et al. 2010, 2011, 2013, 2016; Bolick et al. 2012, 2013). Additionally, these data are used to develop and calibrate a new salmon production model known as the Stream Salmonid Simulator or S³ model (Perry et al. 2018). Data from this project will also be useful for assessing the status and trends of salmonid populations in the Klamath River. Data collected by this project from 2000 through 2016 are summarized in Gough et al. (2015) and David et al. (2016, 2017a, 2017b). This report summarizes data collected during the 2017 trapping season.

Study Area

Monitoring was conducted at three sites on the mainstem Klamath River (Figure 1) between Iron Gate Dam [river kilometer (rkm) 310.0] and the Scott River confluence (rkm 232.9). The upstream-most site (rkm 307.8) was 1.6 km downstream of the Bogus Creek confluence on Blue Heron RV Park property (Bogus site). The middle site (rkm 293.5) was 0.2 km downstream of the Carson Creek confluence and 0.9 km upstream of where Interstate 5 crosses the Klamath River (I-5 site). The farthest downstream site (rkm 237.5) was 0.5 km upstream of the Kinsman Creek confluence (Kinsman site).

Methods

River Conditions

River discharge and water temperature were monitored throughout the trapping season. The USGS gaging station below Iron Gate Dam (# 11516530) was used to represent discharge at the Bogus and I-5 trap sites since accretions from tributaries between the gaging station and these sites are minimal. Discharge at the Kinsman trap site was estimated by subtracting the discharge of the Scott River near Fort Jones (USGS gaging station 11519500) from the discharge of the Klamath River near Seiad Valley (USGS gaging station 11520500). Water

temperature was monitored near each trap site using digital data loggers. For details on the loggers used and specific protocols see David and Goodman (2017).

Trap Design and Operation

One of two sampling methods, rotary screw traps (RSTs) or frame nets, was used at each of the trap sites. Frame nets were placed closer to the bank in shallower, slower moving water compared to RST placement, and more efficiently captured younger and smaller age-0 salmonids along river margins earlier in the season (late winter to early spring). RSTs were set further from the bank in faster, deeper water and more efficiently captured older and larger age-0 and age-1 salmonids later in the season (late spring to early summer). Frame nets were placed near the bank at a location such that water velocity was ideally between 1.0 and 1.2 m/s at the center of the net and water depth was between 0.3 and 1.0 m. RSTs were placed further from the bank such that the cone would ideally spin between five and seven revolutions/min.

In 2017, one frame net (3 m by 1.5 m opening) was operated at the Bogus trap site, two 2.4-m (8-ft) diameter RSTs were operated at the I-5 trap site, and one 1.5-m (5-ft) diameter RST was operated at the Kinsman trap site. An RST was not operated at the Bogus site because few larger, late-season juvenile Chinook Salmon pass by this location due to its proximity to Iron Gate Dam. The Bogus frame net and I-5 RSTs were deployed in late February and early March, respectively. High and variable river flows prevented the deployment of the Kinsman RST until the beginning of June and prevented the use of a frame net at the I-5 trap site throughout the trapping season. The Bogus frame net and I-5 RSTs were operated until late May, when Iron Gate Hatchery (IGH) began its annual release of age-0 Chinook Salmon. The Kinsman RST was operated until late June.

All traps were typically operated over four consecutive nights each week (Monday–Thursday nights) throughout the sampling period and checked once per day. The following information was recorded for each trap on each day: date, site, trap type, crew members, air and water temperatures, trap check time, trap reset time, trap depth, and center velocity. Rotation rates at the times of checks and resets of RSTs were also measured as a count of complete cone revolutions in a minimum of 180 seconds. Air temperature was taken in the shade close to the river’s edge. Water temperature was taken at the surface in the shade and in moving water. Trap depth of RSTs was the submerged depth of the cone. Trap depth of frame nets was the water depth at the midpoint of the frame entrance. Center velocity was the water velocity at 60% of the trap depth. If a trap was relocated, RST rotations, trap depth, and center velocity were then re-measured.

All captured fish were identified and enumerated. A maximum daily biological sample (‘biosample’) for each trap type at each trap site of 30 fish from each salmonid species and 10 fish from each non-salmonid species were measured and examined, including up to 10 lamprey ammocoetes from each genus and 10 eyed lamprey from each species. The following data were recorded for all salmonids in the biosample: age (0 or 1+), fork length (FL), weight, presence/absence of a hatchery mark, presence of any external abnormalities, and abdomen condition (normal or distended). Gill color (red, pale/pink, or white/gray/tan) and condition (normal or eroded/fungal) were recorded for salmonids ≥ 45 mm FL. The following data were recorded for non-salmonids in the biosample: species, development

stage [lampreys only (ammocoete, eyed juvenile, or adult)], FL (or total length for species with pointed or round caudal fins), and presence of any external abnormalities.

Typically, weekly and seasonal totals of natural-origin age-0 Chinook Salmon outmigrating past a trap site are estimated using a Bayesian time-stratified spline population estimation method (Bonner et al. 2009). However, because of high and variable river flows, limited trap catches, and limited age-0 Chinook Salmon available from IGH for use in mark-recapture estimates of trap efficiency, we were unable to derive population estimates for any of the trap sites in 2017.

Results and Discussion

River Conditions

Discharge below Iron Gate Dam, most pertinent to the Bogus and I-5 trap sites, was approximately 30 m³/s at the beginning of February, while discharge at the Kinsman trap site was approximately 80 m³/s (Figure 2). River flows rapidly increased due to a series of large storms in early and mid-February, peaking at approximately 245 m³/s below Iron Gate Dam and 695 m³/s at the Kinsman trap site. Discharge declined to around 65 m³/s below Iron Gate Dam in early March, providing a window for the installation of the Bogus frame net and I-5 RSTs. Flows then increased again, peaking around 285 m³/s below Iron Gate Dam and around 440 m³/s at the Kinsman trap site in late March. After receding, flows rose again to a smaller peak in mid-April, then generally declined throughout the remainder of the trapping season (Figure 2). Flows were above long-term averages during much of the sampling season. In addition to delaying the deployment of the Kinsman RST, the high flows prevented the operation of traps at the Bogus and I-5 sites during some weeks and contributed to flawed sets at all three trap sites. Water temperatures generally increased throughout the trapping season at all three trap sites (Figure 2); however, day-to-day variation in water temperatures also occurred.

Salmonid Catch and Biological Data

Chinook Salmon

High and variable river flows throughout much of the trapping season prevented the continual operation of traps, contributed to flawed sets at all three trap sites that precluded estimates of abundance, and likely contributed to the overall low catches observed relative to other years. Natural-origin age-0 Chinook Salmon were captured at each of the three trap sites in all weeks that sampling occurred (Appendix A), although in low numbers relative to most other years. Peak natural-origin age-0 Chinook Salmon catches occurred during calendar week 18 (early May) at the Bogus and I-5 trap sites, and during calendar week 24 (mid-June) at the Kinsman trap site (Appendix A), but peak outmigration may have occurred before the Kinsman RST installation. No age-1 Chinook Salmon were captured at any of the trap sites and no hatchery-origin Chinook Salmon were captured at the Bogus and I-5 trap sites because sampling ceased before the release of age-0 Chinook Salmon from IGH on May 26. Hatchery-origin age-0 Chinook Salmon were captured during the last three weeks of sampling at the Kinsman trap site. All catch data for Chinook Salmon provided in Appendix A are raw catches and are not adjusted for effort or trap efficiency and do not encompass the entire outmigration period.

No natural-origin age-0 Chinook Salmon exhibited distended abdomens (an indication of infection with the parasite *Ceratonova shasta*) at the Bogus and I-5 trap sites in 2017 (Table 1). A single natural-origin age-0 Chinook Salmon with a distended abdomen was observed at the Kinsman trap site during the month of June. Visibly unhealthy gills were observed on two (8.7%), two (0.9%), and five (4.0%) natural-origin age-0 Chinook Salmon examined for gill condition at the Bogus, I-5, and Kinsman trap sites, respectively (Table 1). Abdomen and gill condition are useful real-time indicators of fish health and disease prevalence. However, prevalence of infection is better determined through genetic analysis and histological examination (e.g., True et al. 2016). To more accurately determine prevalence of infection for the juvenile Chinook Salmon population passing the Kinsman trap site, weekly-stratified random samples were collected, preserved, and delivered to the California–Nevada Fish Health Center (CA–NV FHC) to process using qPCR assays. The CA–NV FHC investigates infection rates of *C. shasta*, *Parvicapsula minibicornis*, and other pathogens in juvenile salmonids annually in the Klamath River below Iron Gate Dam.

Natural-origin age-0 Chinook Salmon mean weekly fork lengths were relatively stable or gradually increased throughout the sampling periods at the Bogus frame net and Kinsman RST, while mean weekly fork lengths steadily increased throughout the sampling period at the I-5 trap site (Figure 3, Figure 4, Figure 5, Appendix B, Appendix C, Appendix D). Length–weight relationships for Chinook Salmon are presented in Figure 6.

Coho Salmon

Natural-origin age-0 Coho Salmon were first captured in early March at the I-5 trap site and in early April at the Bogus trap site. They were observed in low numbers, in comparison to previous years, throughout most of the remainder of the trapping season (Appendix A). Natural-origin age-0 Coho Salmon were also observed in low numbers at the Kinsman trap site throughout June. Peak natural-origin age-0 Coho Salmon catches occurred during calendar week 17 (late April) at the Bogus and I-5 trap site and during calendar week 24 (late June) at the Kinsman trap site. No natural-origin or hatchery-origin age-1 Coho Salmon were observed at the Bogus and Kinsman trap sites (Appendix A). Three natural-origin and ten hatchery-origin age-1 Coho Salmon were captured at the I-5 trap site. IGH releases age-1 Coho Salmon, 100% marked with a left maxillary clip, annually between mid-March and early April. In 2017, this release occurred on March 24 (calendar week 12). All catch data for Coho Salmon provided in Appendix A are raw catches and are not adjusted for effort or trap efficiency and do not encompass the entire outmigration period.

Natural-origin age-0 Coho Salmon mean weekly fork lengths were relatively stable throughout sampling periods at all three trap sites (Figure 3, Figure 4, Figure 5, Appendix B, Appendix C, Appendix D). Length–weight relationships for Coho Salmon are presented in Figure 6.

Steelhead

Natural-origin age-0 steelhead were first observed in early May and mid-April at the Bogus and I-5 trap sites, respectively (Appendix A). Natural-origin age-0 steelhead were also observed during two of the five weeks the Kinsman RST was operated. Natural-origin age-1+ steelhead were observed throughout most of the trapping season, with the lowest catches in the Bogus frame net and the highest catches in the Kinsman RST (Appendix A). Peak

natural-origin age-1+ steelhead catches occurred during calendar week 21 (late May) at the I-5 trap site and during calendar week 24 (mid-June) at the Kinsman trap site. All catch data for steelhead provided in Appendix A are raw catches and are not adjusted for effort or trap efficiency and do not encompass the entire outmigration period.

No clear patterns or trends were apparent in steelhead mean weekly fork lengths at any of the three trap sites, likely due in part to low sample sizes (Figure 3, Figure 4, Figure 5, Appendix E, Appendix F, Appendix G). Length–weight relationships for steelhead are presented in Figure 6.

Other Species

Sampling efforts were designed to target juvenile salmonids, but a variety of other fishes were also captured in the traps. In total, 13 non-target species were captured. The most common non-target fishes captured at the Bogus trap site were non-native sunfish (*Lepomis* spp.) and Golden Shiner (*Notemigonus crysoleucas*) (Table 2). The most common non-target fishes captured at the I-5 trap site were non-native Yellow Perch (*Perca flavescens*), Golden Shiner (*N. crysoleucas*), native Speckled Dace (*Rhinichthys osculus*), and Klamath River Lamprey (*Entosphenus similis*) (Table 2). The most common non-target fishes captured at the Kinsman site were native Speckled Dace (*R. osculus*), Klamath River Lamprey (*E. similis*), suckers (*Catostomus* spp.), and non-native bullhead (*Ameiurus* spp.) (Table 2).

Table 1. Mainstem Klamath River weekly natural-origin age-0 Chinook Salmon health information, 2017. Salmonid gills were classified as healthy if they were red in color and free of fungus and erosion. Gills were classified as unhealthy if they were pink/white/tan/gray in color, fungal, or eroded. A distended abdomen is an indication of potential infection with the parasite *Ceratonova shasta*. These data are also collected for juvenile Coho Salmon and steelhead but are not reported here.

Trap site	Calendar Week	Sample dates	Gill condition			Abdomen condition		
			Number examined	Number unhealthy	Percent unhealthy	Number examined	Number distended	Percent distended
Bogus	9	2/28-3/2	0	0	--	2	0	0.0%
	10	3/8-3/10	0	0	--	2	0	0.0%
	14	4/6-4/7	0	0	--	3	0	0.0%
	15	4/11-4/12	3	0	0.0%	3	0	0.0%
	16	4/19-4/21	3	1	33.3%	6	0	0.0%
	17	4/25-4/28	2	0	0.0%	2	0	0.0%
	18	5/2-5/5	7	1	14.3%	9	0	0.0%
	19	5/9-5/12	4	0	0.0%	4	0	0.0%
	20	5/16-5/19	0	0	--	1	0	0.0%
	21	5/23-5/25	4	0	0.0%	5	0	0.0%
	Total		23	2	8.7%	37	0	0.0%
I-5	10	3/9-3/10	0	0	--	9	0	0.0%
	11	3/14-3/14	0	0	--	15	0	0.0%
	14	4/4-4/7	13	0	0.0%	22	0	0.0%
	15	4/11-4/12	3	0	0.0%	3	0	0.0%
	16	4/19-4/21	31	0	0.0%	35	0	0.0%
	17	4/25-4/28	63	0	0.0%	65	0	0.0%
	18	5/2-5/5	88	0	0.0%	90	0	0.0%
	19	5/9-5/12	12	0	0.0%	12	0	0.0%
	20	5/16-5/19	2	0	0.0%	3	0	0.0%
	21	5/23-5/25	10	2	20.0%	11	0	0.0%
	Total		222	2	0.9%	265	0	0.0%
Kinsman	22	6/1-6/2	36	0	0.0%	36	0	0.0%
	23	6/6-6/9	89	1	1.1%	89	0	0.0%
	24	6/14-6/16	77	3	3.9%	77	0	0.0%
	25	6/20-6/23	19	1	5.3%	19	1	5.3%
	26	6/27-6/30	4	0	0.0%	4	0	0.0%
	Total		225	5	2.2%	225	1	0.4%

Table 2. Catch totals of non-target fish species in the mainstem Klamath River at the three trap sites (all traps within a site combined), 2017.

Common name	Scientific name	Trap site		
		Bogus	I-5	Kinsman
Ammocoete (<i>Entosphenus</i>)	<i>Entosphenus</i> spp.	7	9	12
Bullhead ^a	<i>Ameiurus</i> spp.	7	17	82
Coastrange Sculpin	<i>Cottus aleuticus</i>	0	1	0
Crappie ^a	<i>Pomoxis</i> spp.	0	1	0
Fathead Minnow ^a	<i>Pimphales promelas</i>	0	5	1
Golden Shiner ^a	<i>Notemigonus crysoleucas</i>	10	42	1
Klamath River Lamprey	<i>Entosphenus similis</i>	5	33	111
Largemouth Bass ^a	<i>Micropterus salmoides</i>	1	0	0
Marbled Sculpin	<i>Cottus klamathensis</i>	7	18	3
Speckled Dace	<i>Rhinichthys osculus</i>	2	44	145
Sucker spp.	<i>Catostomus</i> spp.	2	4	40
Sunfish ^a	<i>Lepomis</i> spp.	15	19	1
Yellow Perch ^a	<i>Perca flavescens</i>	9	163	2

^a Non-native

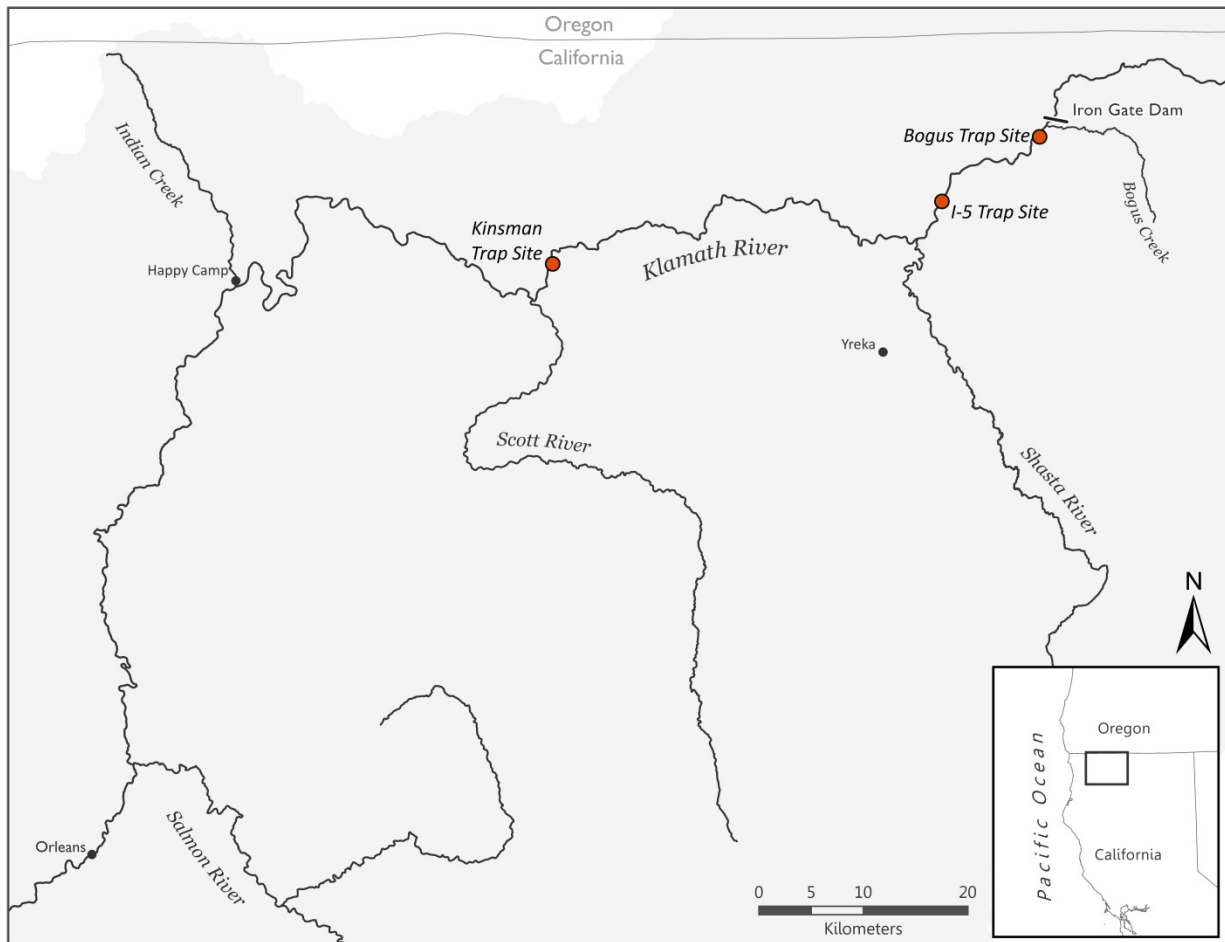


Figure 1. The middle Klamath River basin with trap sites identified.

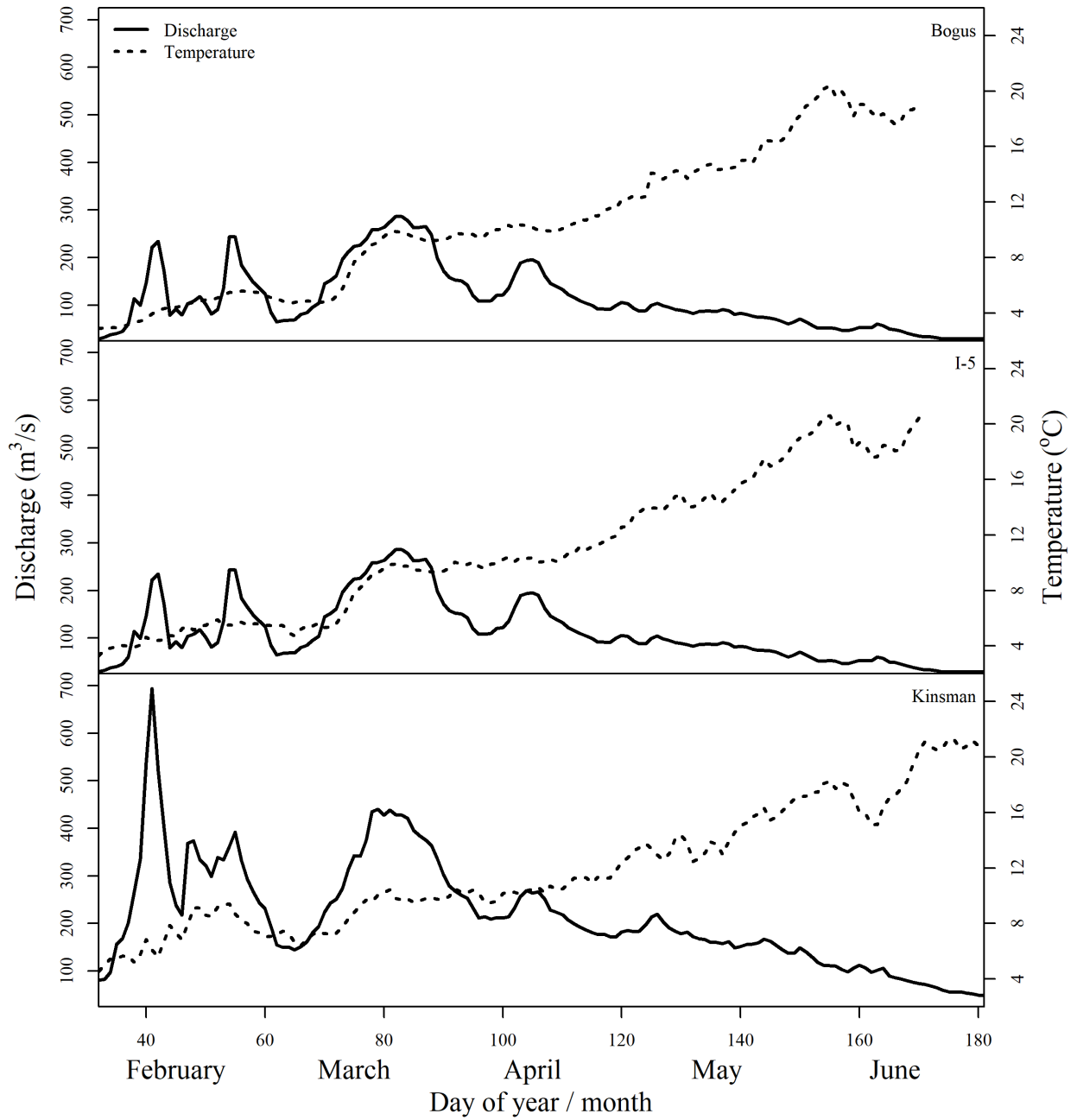


Figure 2. Klamath River mean daily discharge (m³/s) and mean daily temperature (°C) at the three trap sites for February through the end of June, 2017.

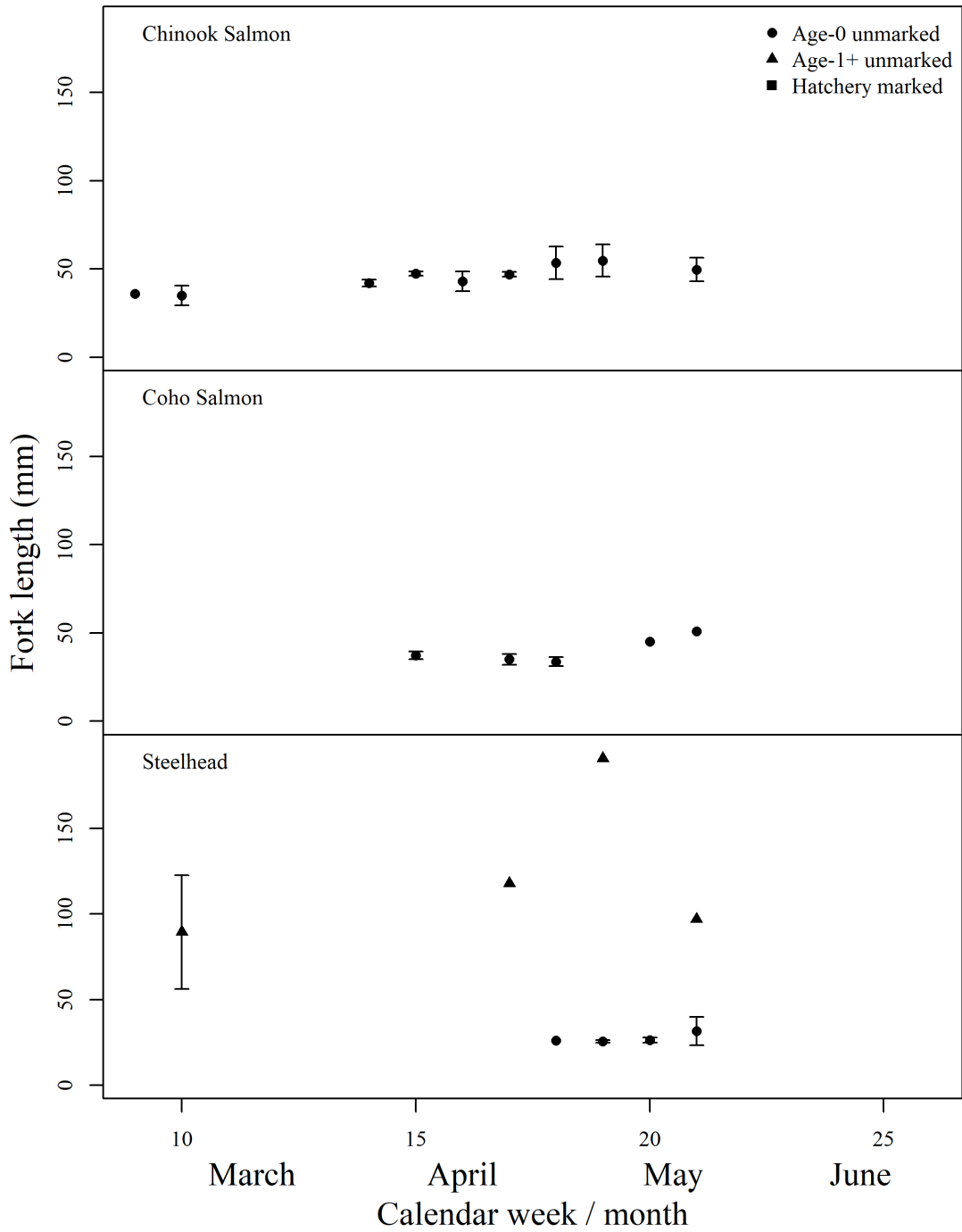


Figure 3. Weekly mean fork lengths (\pm one standard deviation) of unmarked age-0, unmarked age-1+, and hatchery-marked Chinook Salmon, Coho Salmon, and steelhead captured at the Klamath River Bogus frame net, 2017.

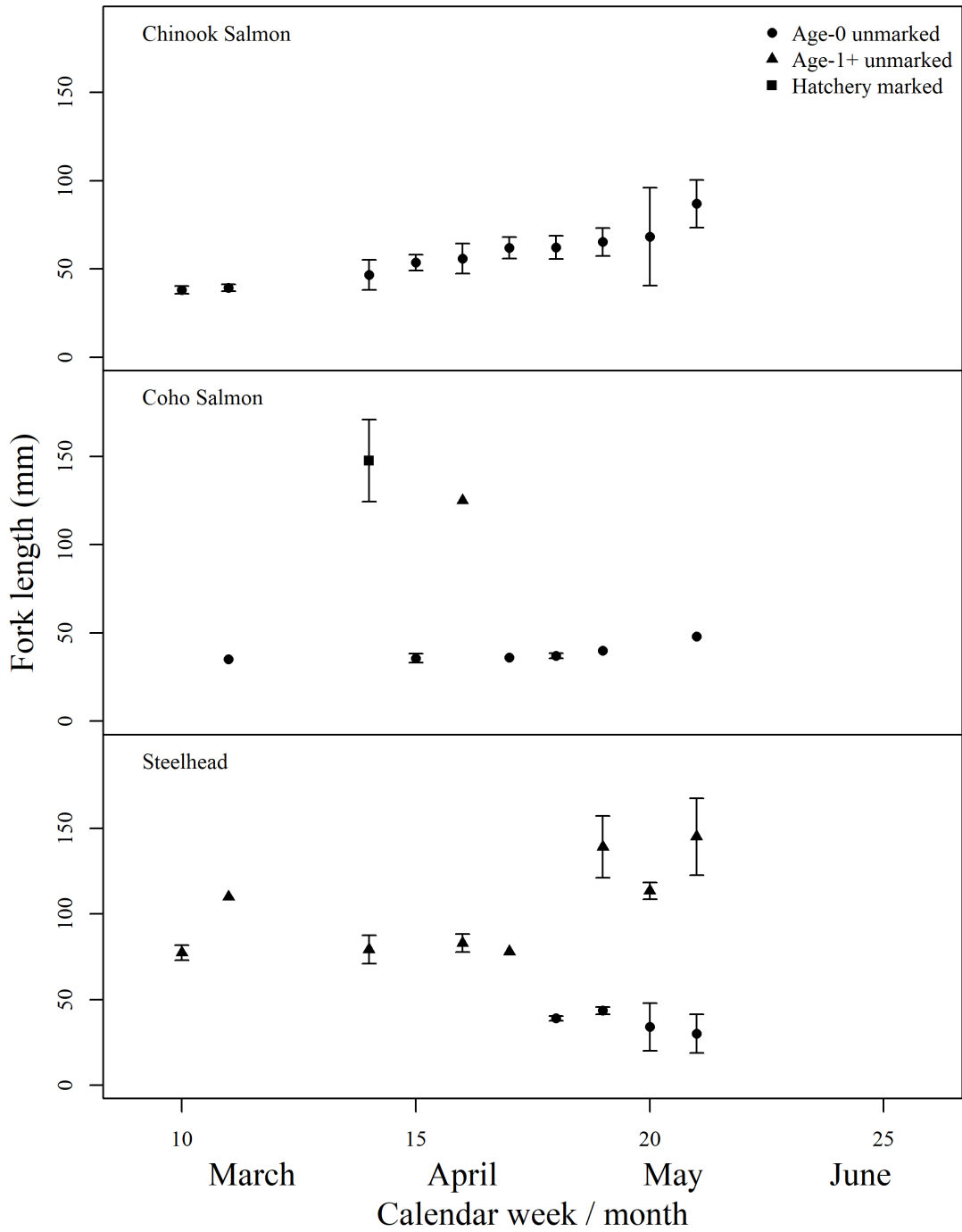


Figure 4. Weekly mean fork lengths (\pm one standard deviation) of unmarked age-0, unmarked age-1+, and hatchery-marked Chinook Salmon, Coho Salmon, and steelhead captured at the Klamath River I-5 RSTs, 2017.

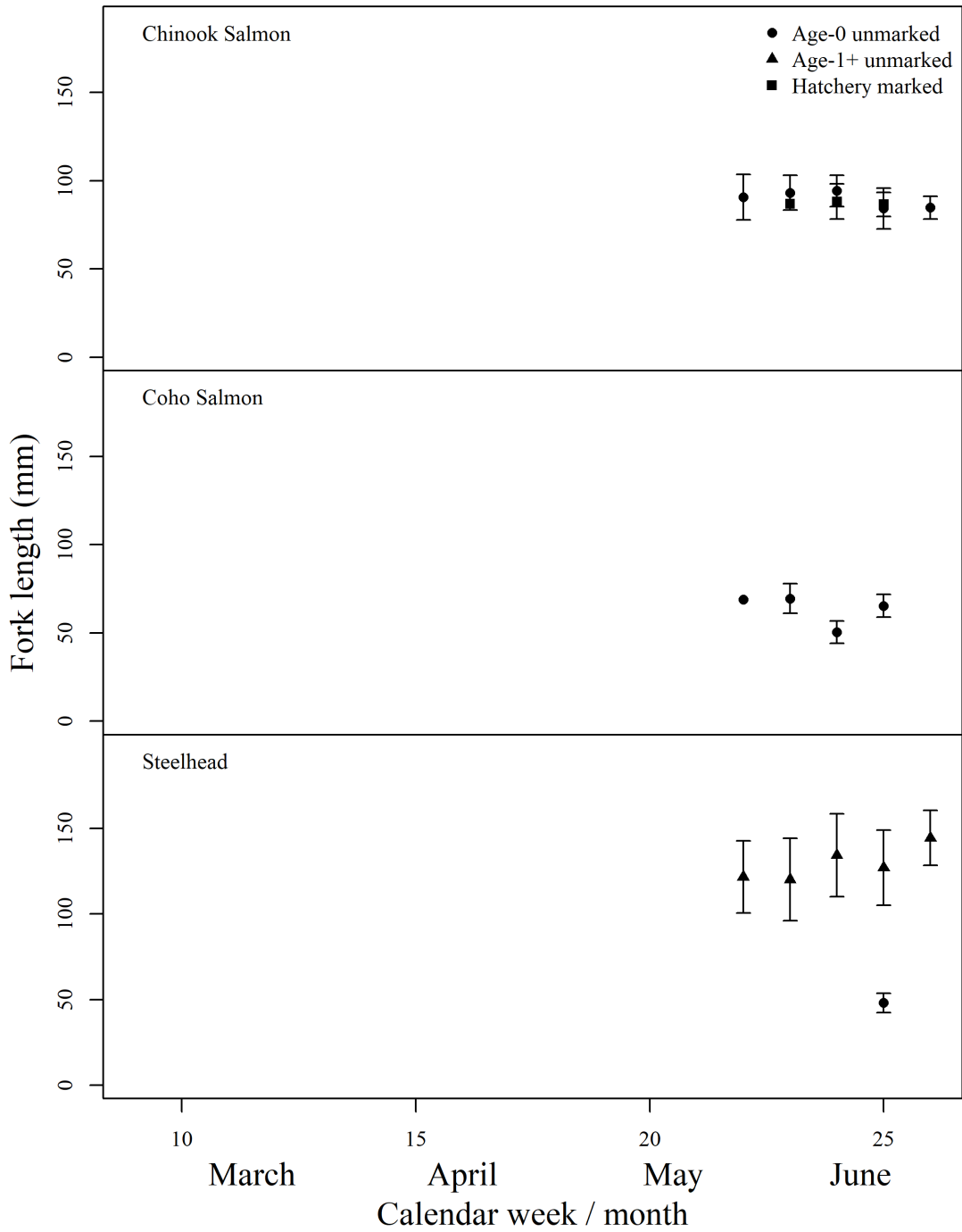


Figure 5. Weekly mean fork lengths (\pm one standard deviation) of unmarked age-0, unmarked age-1+, and hatchery-marked Chinook Salmon, Coho Salmon, and steelhead captured at the Klamath River Kinsman RST, 2017.

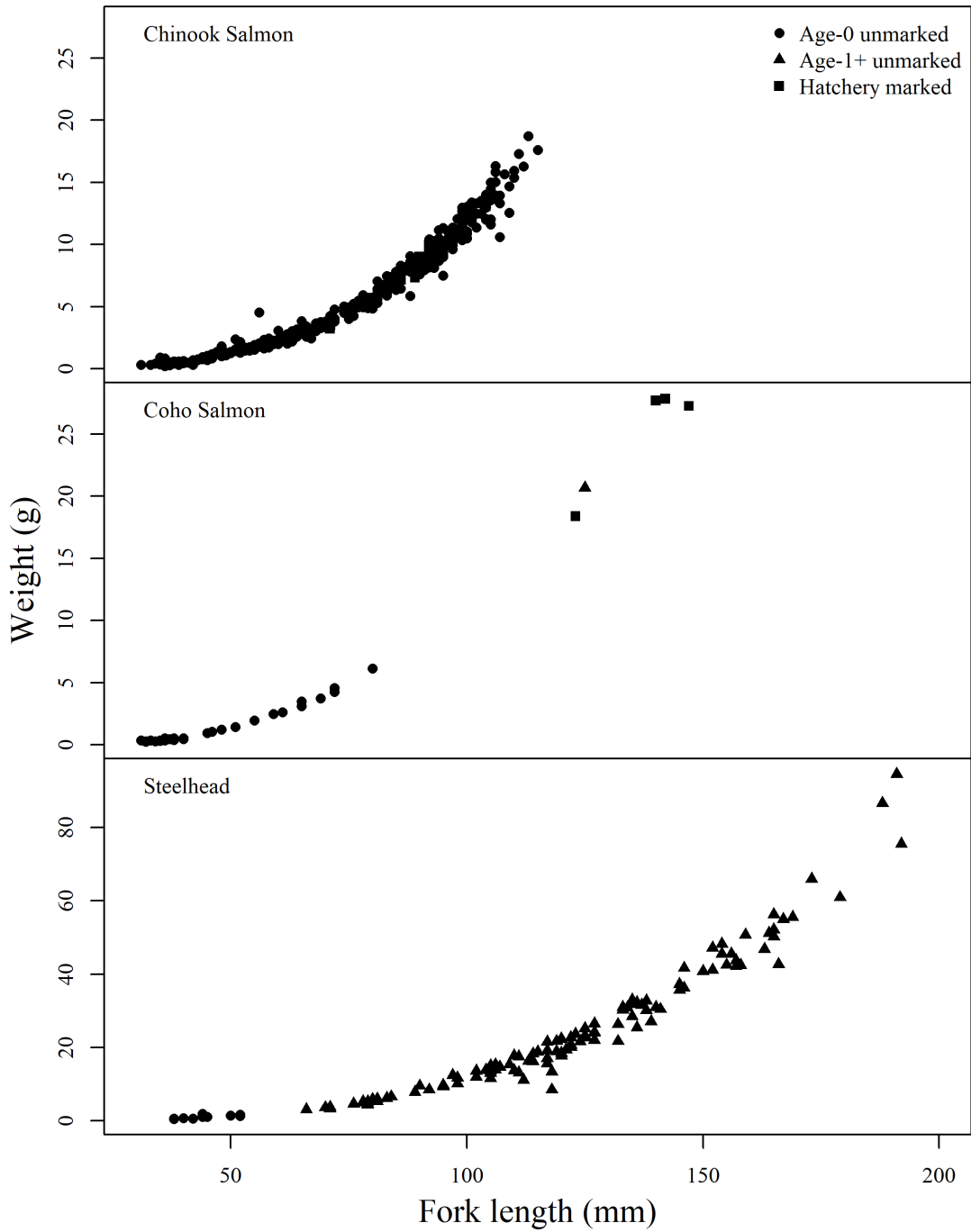


Figure 6. Weight plotted against fork length for individual juvenile Chinook Salmon, Coho Salmon, and steelhead, all trap sites combined, 2017. Please note the difference in scale of the y-axes.

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Appendices

Appendix A. Mainstem Klamath River weekly juvenile salmonid outmigrant trap catch summary, 2017.

Trap	Calendar week	Sample dates	Trap days	Mean Q (m ³ /s)	Water temp (C)			Chinook Salmon		Coho Salmon			Steelhead		
					Min	Max	Mean	Age-0		Age-0	Age-1+		Age-0	Age-1+	
								No clip	AD clip		No clip	LM clip			No clip
Bogus Frame	9	2/28-3/2	3	113	4.7	5.7	5.3	3	0	0	0	0	0	0	0
	10	3/8-3/10	3	92	4.7	5.1	4.8	8	0	0	0	0	0	0	2
	14	4/6-4/7	2	128	9.0	10.3	9.7	11	0	0	0	0	0	0	0
	15	4/11-4/12	2	160	9.8	10.7	10.2	3	0	4	0	0	0	0	0
	16	4/19-4/21	3	144	9.6	11.2	10.1	6	0	1	0	0	0	0	0
	17	4/25-4/28	4	98	10.4	12.2	11.1	11	0	6	0	0	0	0	1
	18	5/2-5/5	4	98	11.5	15.0	12.8	13	0	3	0	0	0	2	0
	19	5/9-5/12	4	90	13.0	15.2	14.0	4	0	0	0	0	0	5	1
	20	5/16-5/19	4	86	13.9	16.4	14.6	1	0	1	0	0	0	10	1
21	5/23-5/25	3	74	14.5	17.7	15.9	5	0	1	0	0	0	12	1	
I-5 RST	10	3/9-3/10	4	92	4.5	6.7	5.3	28	0	1	0	0	0	0	9
	11	3/14-3/14	2	201	4.7	9.0	7.0	17	0	1	0	0	0	0	1
	14	4/4-4/7	7	128	8.9	11.0	9.9	38	0	0	0	7	0	0	6
	15	4/11-4/12	4	160	9.3	11.4	10.3	4	0	3	0	0	0	0	0
	16	4/19-4/21	6	144	9.6	12.0	10.3	69	0	2	1	0	0	1	7
	17	4/25-4/28	8	98	10.4	13.3	11.4	76	0	4	0	0	0	0	2
	18	5/2-5/5	8	98	11.4	15.7	13.4	274	0	3	1	1	5	1	1
	19	5/9-5/12	8	90	12.7	16.6	14.3	15	0	1	1	0	3	3	3
	20	5/16-5/19	8	86	13.3	16.8	14.9	6	0	0	0	2	4	6	6
21	5/23-5/25	6	74	14.4	19.3	16.8	12	0	1	0	0	3	10	10	
Kinsman RST	22	6/2-6/2	1	132	15.4	19.2	17.3	47	0	1	0	0	0	0	11
	23	6/6-6/6	1	107	15.5	19.1	17.3	66	0	1	0	0	0	0	7
	24	6/14-6/16	3	92	14.5	19.5	16.7	166	20	3	0	0	7	34	
	25	6/20-6/23	4	68	18.4	23.3	20.6	50	14	4	0	0	6	31	
	26	6/27-6/30	4	53	19.1	23.0	21.0	10	1	1	0	0	0	0	11

Appendix B. Klamath River at Bogus site (frame net) weekly unmarked and hatchery-marked Chinook and Coho salmon fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked Chinook Salmon										Unmarked Coho Salmon										Marked Coho Salmon				
		Age-0					Age-1+					Age-0					Age-1+					Age-1+				
		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
9	2/28-3/2	2	36.0	36	36	0.0	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
10	3/8-3/10	2	35.0	31	39	5.7	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
14	4/6-4/7	3	42.0	40	44	2.0	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
15	4/11-4/12	3	47.3	46	48	1.2	0	--	--	--	--	4	37.3	35	40	2.2	0	--	--	--	--	0	--	--	--	--
16	4/19-4/21	5	43.0	37	48	5.5	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
17	4/25-4/28	2	47.0	46	48	1.4	0	--	--	--	--	6	35.0	32	38	3.0	0	--	--	--	--	0	--	--	--	--
18	5/2-5/5	9	53.4	42	68	9.2	0	--	--	--	--	3	33.7	31	36	2.5	0	--	--	--	--	0	--	--	--	--
19	5/9-5/12	4	54.8	45	63	9.1	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
20	5/16-5/19	0	--	--	--	--	--	--	--	--	--	1	45.0	45	45	0.0	0	--	--	--	--	0	--	--	--	--
21	5/23-5/25	5	49.6	43	60	6.7	0	--	--	--	--	1	51.0	51	51	0.0	0	--	--	--	--	0	--	--	--	--

Appendix C. Klamath River at I-5 site (RST) weekly unmarked and hatchery-marked Chinook and Coho salmon fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked Chinook Salmon										Unmarked Coho Salmon										Marked Coho Salmon				
		Age-0					Age-1+					Age-0					Age-1+					Age-1+				
		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
10	3/9-3/10	9	38.1	36	42	2.1	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
11	3/14-3/14	15	39.3	36	42	2.1	0	--	--	--	--	1	35.0	35	35	0.0	0	--	--	--	--	0	--	--	--	--
14	4/4-4/7	22	46.6	31	58	8.5	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	5	147.6	123	186	23.3
15	4/11-4/12	3	53.7	49	58	4.5	0	--	--	--	--	3	35.7	33	38	2.5	0	--	--	--	--	0	--	--	--	--
16	4/19-4/21	35	55.8	33	70	8.5	0	--	--	--	--	0	--	--	--	--	1	125.0	125	125	0.0	0	--	--	--	--
17	4/25-4/28	64	62.0	38	75	6.0	0	--	--	--	--	2	36.0	36	36	0.0	0	--	--	--	--	0	--	--	--	--
18	5/2-5/5	90	62.2	39	88	6.5	0	--	--	--	--	2	37.0	36	38	1.4	0	--	--	--	--	0	--	--	--	--
19	5/9-5/12	12	65.3	53	79	7.9	0	--	--	--	--	1	40.0	40	40	0.0	0	--	--	--	--	0	--	--	--	--
20	5/16-5/19	3	68.3	37	90	27.8	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--
21	5/23-5/25	12	86.9	65	108	13.4	0	--	--	--	--	1	48.0	48	48	0.0	0	--	--	--	--	0	--	--	--	--

Appendix D. Klamath River at Kinsman site (RST) weekly unmarked and hatchery-marked Chinook and Coho salmon fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked Chinook Salmon										Unmarked Coho Salmon										Marked Coho Salmon				
		Age-0					Age-1+					Age-0					Age-1+					Age-1+				
		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
22	6/1-6/2	36	90.8	68	112	12.9	0	--	--	--	1	69.0	69	69	0.0	0	--	--	--	--	0	--	--	--	--	
23	6/6-6/9	89	93.2	54	113	9.9	0	--	--	--	4	69.5	61	80	8.4	0	--	--	--	--	0	--	--	--	--	
24	6/14-6/16	77	94.3	63	115	8.9	0	--	--	--	2	50.5	46	55	6.4	0	--	--	--	--	0	--	--	--	--	
25	6/20-6/23	19	84.3	56	102	11.6	0	--	--	--	3	65.3	59	72	6.5	0	--	--	--	--	0	--	--	--	--	
26	6/27-6/30	4	84.8	80	94	6.4	0	--	--	--	0	--	--	--	--	0	--	--	--	--	0	--	--	--	--	

Appendix E. Klamath River at Bogus site (frame net) weekly unmarked steelhead fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked steelhead									
		Age-0					Age-1+				
		n	mean	min	max	sd	n	mean	min	max	sd
10	3/8-3/10	0	--	--	--	--	2	89.5	66	113	33.2
17	4/25-4/28	0	--	--	--	--	1	118.0	118	118	0.0
18	5/2-5/5	1	26.0	26	26	0.0	0	--	--	--	--
19	5/9-5/12	2	25.5	25	26	0.7	1	191.0	191	191	0.0
20	5/16-5/19	10	26.2	24	28	1.5	0	--	--	--	--
21	5/23-5/25	12	31.6	24	52	8.3	1	97.0	97	97	0.0

Appendix F. Klamath River at I-5 site (RST) weekly unmarked steelhead fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked steelhead									
		Age-0					Age-1+				
		n	mean	min	max	sd	n	mean	min	max	sd
10	3/9-3/10	0	--	--	--	--	5	77.4	71	83	4.4
11	3/14-3/14	0	--	--	--	--	1	110.0	110	110	0.0
14	4/4-4/7	0	--	--	--	--	6	79.3	70	92	8.2
16	4/19-4/21	0	--	--	--	--	3	83.0	79	89	5.3
17	4/25-4/28	0	--	--	--	--	1	78.0	78	78	0.0
18	5/2-5/5	2	39.0	38	40	1.4	0	--	--	--	--
19	5/9-5/12	2	43.5	42	45	2.1	3	139.3	122	158	18.0
20	5/16-5/19	3	34.0	25	50	13.9	2	113.5	110	117	5.0
21	5/23-5/25	2	30.0	22	38	11.3	9	145.2	114	192	22.5

Appendix G. Klamath River at Kinsman site (RST) weekly unmarked steelhead fork lengths (mm), 2017.

Calendar week	Sample dates	Unmarked steelhead									
		Age-0					Age-1+				
		n	mean	min	max	sd	n	mean	min	max	sd
22	6/1-6/2	0	--	--	--	--	12	121.7	81	165	21.2
23	6/6-6/9	0	--	--	--	--	14	120.2	95	164	24.1
24	6/14-6/16	0	--	--	--	--	27	134.4	95	179	24.2
25	6/20-6/23	2	48.0	44	52	5.7	23	127.1	90	188	21.9
26	6/27-6/30	0	--	--	--	--	9	144.4	120	169	16.1