

# **2017 Adult Striped Bass Tagging Cruise Report**

California Department of Fish and Wildlife  
Bay Delta Region (Stockton)

by Jason DuBois and Andrew Danos

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Cruise Dates: 17 April 2017 – 17 May 2017

## Introduction

An adult Striped Bass population study conducted by the California Department of Fish and Wildlife has been ongoing since 1969. Part of the study is a “high-value” reward tagging program. Presented here is a summary of the 2017 Striped Bass-tagging field season.

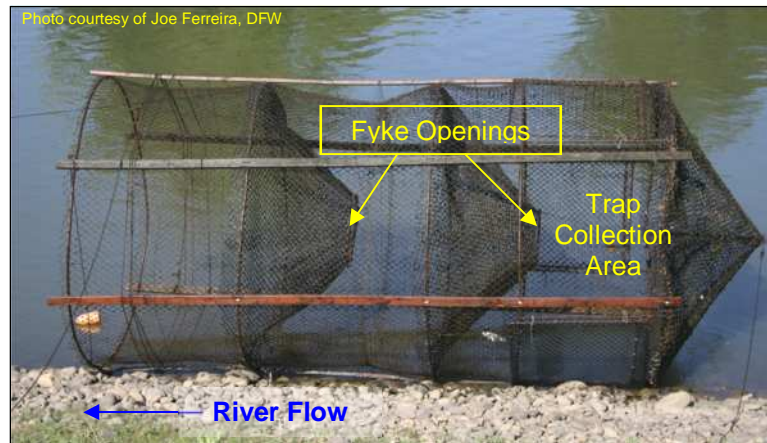
The tagging program is designed to understand and monitor the population dynamics of Striped Bass, with the ultimate goal being to provide the tools to inform science-based resource management decisions. These tools include relative and absolute abundance, harvest rate, mortality rate, individual growth rates, and large-scale movement/migration patterns.

Our objective during the field season was to capture, tag, measure, sex, and release in good condition as many Striped Bass as possible and to document previously-tagged Striped Bass. We also helped another group develop a large set of data that is complementary to ours.

## Methods and Gear

The crew (Appendix 1) typically included three Fish and Wildlife Technicians and a Mate. Tagging was performed per procedure outlined in Appendix 2 of the Sacramento-San Joaquin Sport Fish Management Striped Bass Population Study Quality Control and Operating Manual.

Up to eight cylindrical fyke traps (length 20'; diameter 10'; 9 gauge 2¼-inch mesh) were fished in the Sacramento River near Knights Landing (see photo at right of a fyke trap). Five traps were placed on the east riverbank about two miles upstream of the Knights Landing Bridge (Highway 113). Three traps were placed on the east riverbank about one mile downstream of the Knights Landing Bridge. Traps were placed upwards of 250 feet apart from each other and were secured to temporary (i.e., for the season) moorings on the levee terrace.



Traps were completely submerged while fishing (collecting fish). Striped Bass and other fishes swam through the two openings (marked in photo above) and accumulated in the front (cone) of the trap. To remove fish from a trap, the trap was rolled up the riverbank until one of the doors was positioned to allow relatively easy access from the *Kayot* (~20-foot pontoon boat) while ensuring the trap remained in enough water to minimize fish stress.

An electric winch was used to roll traps up and down the riverbank. When the trap and boat were in position, fish were netted from the trap and processed on board the *Kayot*.

Striped Bass were measured to the nearest centimeter fork length (cm

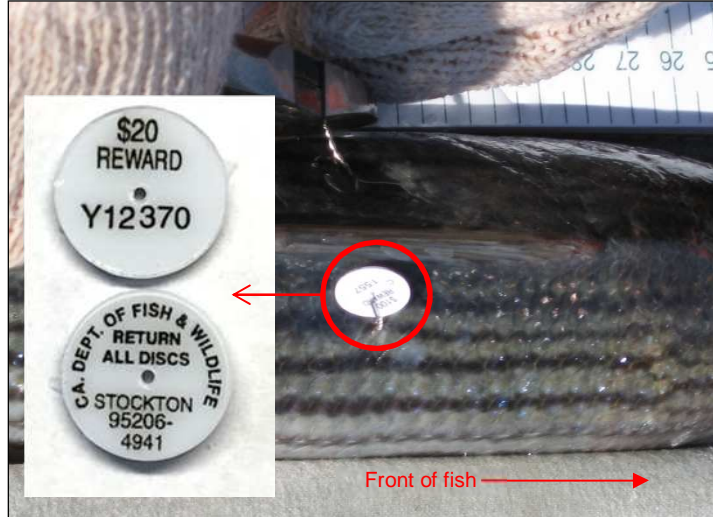


FL). Most were sexed and just over half were fitted with a Petersen disc-dangler tag (see photo below of disc tag as it was applied to the fish; inset is example of the two sides of the tag).

Each tag possessed a unique 6-digit numeric or alpha-numeric identifier and the location of the Fish and Wildlife office to where the tag should be returned. To evaluate return-rate, ~10% of all tags applied offered rewards of \$20 (example shown), \$50, or \$100.

For fish possessing tags from previous years (i.e., recaptures), length, sex, and tag number were recorded.

All live Striped Bass were processed at and returned to the location of capture, and condition (general health) of the fish upon return to the water was noted. Dead Striped Bass were recorded accordingly and added to the total catch. Fish in poor condition were released without a tag, recorded as “over”, and added to the total catch. In a protocol we term “creeling”, healthy fish that could not be tagged safely (e.g., due to time constraints) were enumerated, measured, and sexed but not tagged. This season we did not collect scales of creeled fish.



## Results

Though we intended to begin the season on or about 1-April and end the season on or about 31-May, the season began on 17-April and ended on 17-May. The late start was due to flooding of the terraces from which we must operate. The early conclusion was because higher-priority activities required redirection of the core tagging crew, and the core tagging crew was not replaced because the river stage was forecast to decline substantially and rapidly. Rapid and substantial decline in river stage creates a lot of extra work — very physical work — for the crew, and is usually associated with a decrease in Striped Bass CPUE.

Field days were Monday through Friday and tagging occurred Tuesday through Friday. Field days began at 0700 and ended at 1700 or earlier/later depending on the number of fish caught and/or the number of available personnel. Fyke traps were deployed 16 days, inspected each day for the presence of listed fishes, and tended 114 times. On average, traps fished 24.0 hours between inspections.

Five thousand five hundred sixty-eight (5,568) Striped Bass were caught, of which 2,912 were then tagged (Table 1). One hundred four (104) fish were recorded as “over” and 2,499 fish were creeled. See Table 2 for other information about recaptures and Appendix 2 for the sequence of tags applied.

**Table 1. Summary of fyke trap effort and Striped Bass catch during 2017**

	<b>Total Caught</b>	<b>Total Tagged</b>	<b># Traps Fished</b>	<b># Traps Tended</b>	<b># Days Fished</b>
<b>Total</b>	<b>5,568</b>	<b>2,912</b>	<b>114</b>	<b>114</b>	<b>16</b>
Daily Minimum	89	0	3	3	n/a
Daily Maximum	957	427	8	8	n/a
Daily Average	348	182	7	7	n/a
Minimum/Day/Trap	4	0	n/a	n/a	n/a
Maximum/Day/Trap	267	106	n/a	n/a	n/a
Average/Day/Trap	48	25	n/a	n/a	n/a

A tended trap = fish handled and removed from the trap; this season all traps fished were tended

Forty-nine Striped Bass were recaptures and just one of those was tagged during a previous season (Table 2). Approximately 72% of the so-called “in-season recaptures” had been tagged one day earlier and all but one in-season recapture was recaptured in a different trap. The number of in-season recaptures was far greater than during the last 5 seasons (0-5 fish), as was the proportion of recaptures that were in-season (0-62%).

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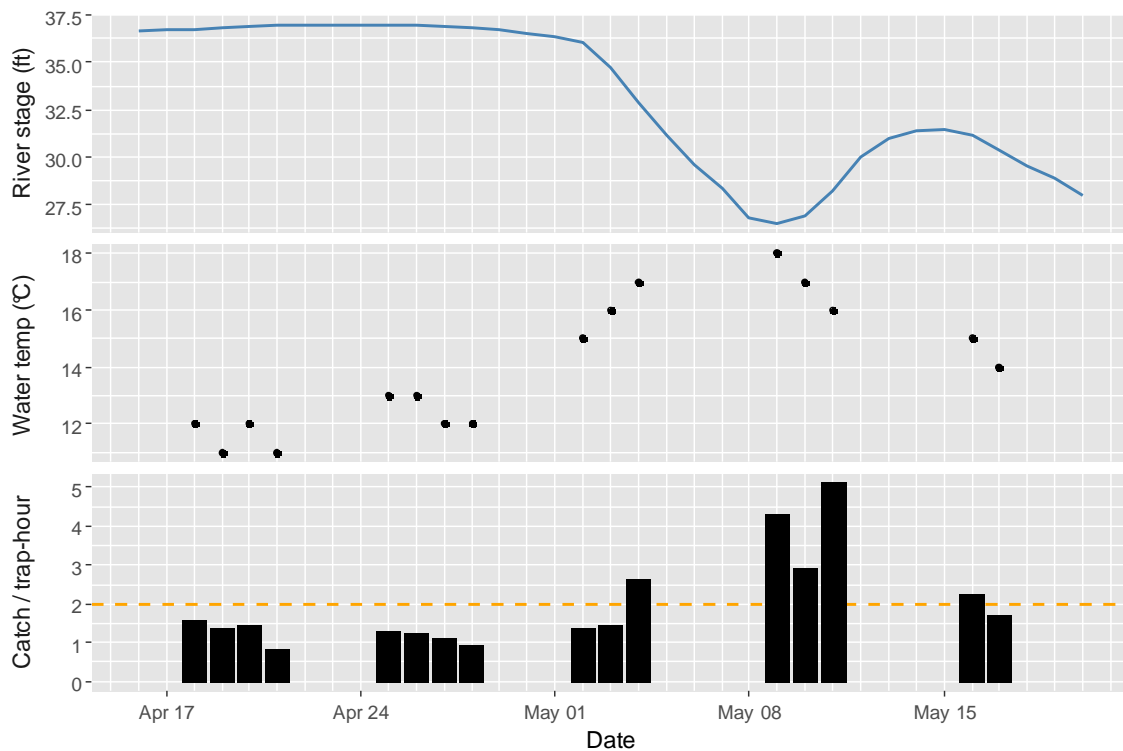
**Table 2. Striped Bass recaptured during 2017 Striped Bass-tagging field work**

Date of Recapture	Tag Number	Date Tagged	Days at Large	Length at Tagging (cm FL)	Length at Recapture (cm FL)	Growth per Year (cm)
9-May	292095	13-Apr-16	391	42	53	10.3
11-May	293982	20-Apr-17	21	38	NA	NA
9-May	293761	19-Apr-17	20	39	NA	NA
9-May	293772	19-Apr-17	20	51	51	NA
9-May	Y12290	20-Apr-17	19	40	39	NA
10-May	294393	25-Apr-17	15	45	NA	NA
3-May	293997	20-Apr-17	13	49	NA	NA
2-May	293997	20-Apr-17	12	49	49	NA
9-May	294503	27-Apr-17	12	38	NA	NA
11-May	294982	2-May-17	9	43	NA	NA
3-May	294704	27-Apr-17	6	44	NA	NA
10-May	295384	4-May-17	6	41	NA	NA
28-Apr	294333	26-Apr-17	2	44	NA	NA
27-Apr	294442	26-Apr-17	1	42	NA	NA
28-Apr	294504	27-Apr-17	1	42	NA	NA
27-Apr	294561	26-Apr-17	1	44	NA	NA
28-Apr	294589	27-Apr-17	1	46	NA	NA
28-Apr	294602	27-Apr-17	1	42	NA	NA
27-Apr	294645	26-Apr-17	1	43	NA	NA
28-Apr	294685	27-Apr-17	1	41	NA	NA
28-Apr	294711	27-Apr-17	1	42	NA	NA
3-May	294878	2-May-17	1	42	NA	NA
3-May	294937	2-May-17	1	37	NA	NA
3-May	294942	2-May-17	1	46	NA	NA
3-May	294955	2-May-17	1	38	NA	NA
3-May	295000	2-May-17	1	38	NA	NA
3-May	295019	2-May-17	1	42	NA	NA
3-May	295050	2-May-17	1	42	NA	NA
3-May	295104	2-May-17	1	49	NA	NA
3-May	295113	2-May-17	1	43	NA	NA
4-May	295137	3-May-17	1	43	NA	NA
3-May	295191	2-May-17	1	52	NA	NA
4-May	295223	3-May-17	1	46	NA	NA
4-May	295263	3-May-17	1	42	NA	NA
4-May	295271	3-May-17	1	44	NA	NA
4-May	295344	3-May-17	1	75	NA	NA
10-May	295830	9-May-17	1	39	NA	NA
10-May	295944	9-May-17	1	47	NA	NA
10-May	295985	9-May-17	1	48	NA	NA
10-May	295991	9-May-17	1	45	NA	NA
10-May	296042	9-May-17	1	41	NA	NA
28-Apr	C02213	27-Apr-17	1	45	NA	NA
3-May	C02231	2-May-17	1	39	NA	NA
27-Apr	F02207	26-Apr-17	1	41	NA	NA
3-May	F02232	2-May-17	1	41	NA	NA
3-May	F02234	2-May-17	1	51	NA	NA
4-May	F02248	3-May-17	1	46	NA	NA
27-Apr	Y12315	26-Apr-17	1	50	NA	NA
10-May	295892	<NA>	NA	NA	NA	NA

Daily average river stage for the Knights Landing-portion of the Sacramento River was calculated from quarter-hourly readings (n=96/day) posted on-line at the California Data Exchange Center's website. River stage remained constant until early May and then dropped steadily reaching a season-low of just below 27.5 feet (Figure 1 – top panel).

Water temperature was recorded by the field crew at the beginning of each tagging day. Average water temperature was 14.0 degrees Celsius (°C, or ~ 57.2 degrees Fahrenheit) for the tagging season (Figure 1 – middle panel).

Striped Bass catch per trap-hour<sup>1</sup> by day was calculated and plotted with river stage and water temperature. Average catch per trap-hour for the tagging season was ~2.0 fish (Figure 1 – bottom panel).



**Figure 1. Daily Striped Bass catch per trap-hour for 2017 (bottom) with daily average river stage at Knights Landing (top) and daily water temperature (middle); notes: (1) date shown in x-axis is Monday, (2) dashed-line (orange) in bottom plot indicates season-average catch per trap-hour (~2.0)**

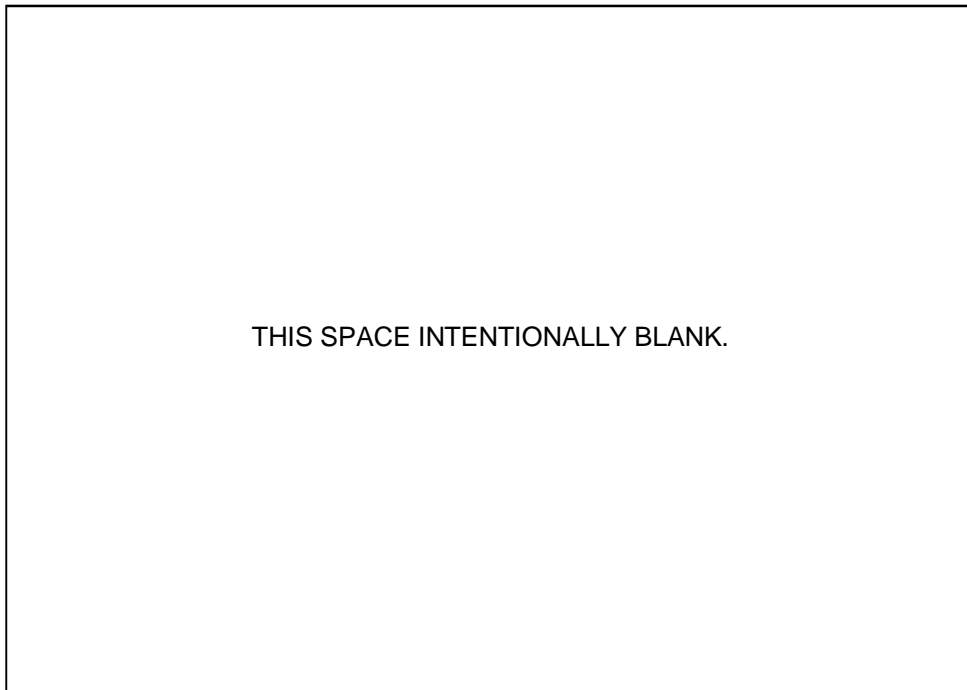
We creeled a large fraction of the fish we caught in Weeks 4 and 5 because we deployed a large number of traps relative to our ability to rapidly tag fish and relative to fish condition given water temperature and density of fish in traps. See Table 3 for other information about weekly effort and catch and Appendix 3 for weekly variation in fork lengths.

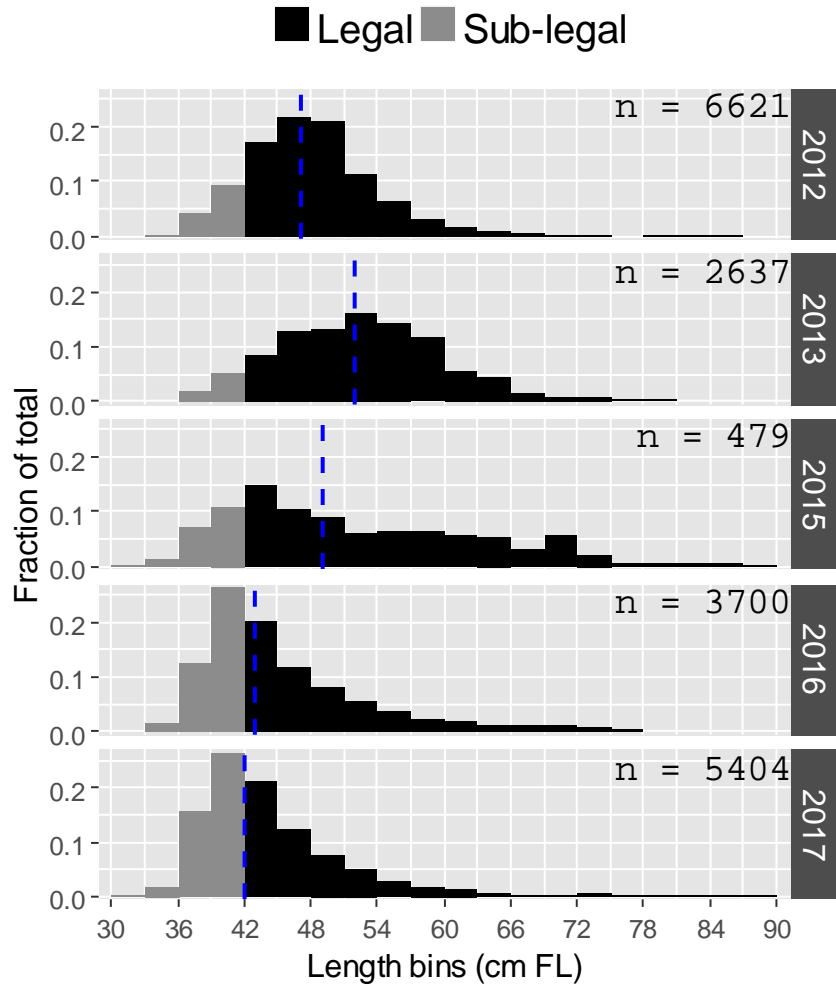
<sup>1</sup> Rounded to nearest ¼-hour and cumulative for the number of traps fishing (for example, if 10 traps each fished 24 hours in one day, then trap-hours for that day equaled 240.) Catch includes any fish left in the trap from the preceding day.

**Table 3. Weekly summary of fyke trap effort and Striped Bass catch in 2017; number in parentheses is calendar week**

<b>Week</b>	<b>1 (16)</b>	<b>2 (17)</b>	<b>3 (18)</b>	<b>4 (19)</b>	<b>5 (20)</b>
Tagged	520	844	957	314	277
Creeled / Not Tagged	2	0	62	2,026	409
Over	13	39	26	16	10
Dead	0	1	0	3	0
Recapture (previous and within season)	0	12	22	15	0
<b>Weekly Total Catch</b>	<b>535</b>	<b>896</b>	<b>1,067</b>	<b>2,374</b>	<b>696</b>
Number of Traps Tended	20	32	24	24	14
Number of Days Fished	4	4	3	3	2
Minimum FL (cm)	32	31	31	22	35
Maximum FL (cm)	104	117	110	117	113
Average FL (cm)	44	44	45	45	44

Of the fish for which a length measurement was recorded (N=5,404), length ranged 22-117 cm FL and averaged  $44 \pm 9$  cm FL ( $\pm$  SD). Of the fish for which sex was recorded (N=5,399), 5,033 were male and 366 were female (14:1 male). On average, females were larger than males ( $\text{♀} = 58 \pm 16$  cm FL,  $\text{♂} = 43 \pm 7$  cm FL). About 44% of all Striped Bass caught (and measured) were sub-legal size (Figure 2 – bottom panel), which was an increase of about 4% from 2016 (40%).





**Figure 2. Length frequency of all Striped Bass collected in fyke traps from 2012-2013 and 2015-2017; notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure ( $n \leq 22$  per year), (2) vertical dashed line (blue) indicates annual median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm**



Twenty-two (22) Chinook Salmon were caught this season and their estimated lengths ranged 34-92 cm (Table 4). Most salmon were brightly colored, all had an adipose fin, and all were released alive in good to excellent condition.

**Table 4. By-catch of the 2017 Striped Bass tagging season**

<b>Other Species (common name)</b>	<b>Scientific Name</b>	<b>Total Count</b>
American Shad	<i>Alosa sapidissima</i>	605
Black Crappie	<i>Pomoxis nigromaculatus</i>	11
Channel Catfish	<i>Ictalurus punctatus</i>	30
Chinook Salmon <sup>a,b</sup>	<i>Oncorhynchus tshawytscha</i>	22
Hardhead	<i>Mylopharodon conocephalus</i>	1
Pumpkinseed	<i>Lepomis gibbosus</i>	4
Sacramento Sucker	<i>Catostomus occidentalis</i>	6
Smallmouth Bass	<i>Micropterus dolomieu</i>	7
Spotted Bass	<i>Micropterus punctulatus</i>	11
White Catfish	<i>Ameiurus catus</i>	10
White Crappie	<i>Pomoxis annularis</i>	1

<sup>a</sup> Fish were released alive in good to excellent condition

<sup>b</sup> All had adipose fin

### Complementary Dataset

Like last season, this season we helped a California Department of Fish and Wildlife crew from Fisheries Branch develop a large complementary dataset while that crew was doing a pilot study to monitor adult Steelhead near Sacramento. We provided data sheets and training to that crew, who then — using fyke traps and methods patterned after ours — creeled 5,269 Striped Bass from 15-Mar to 17-May 2017. See Appendix 4 for length frequency distributions.

We will compare and contrast the datasets soon, but for now note that the two sampling efforts yielded (a) male:female ratios of 14:1 (April-May by us) and 9:1 (March-May by Fisheries Branch) and (b) comparing the length frequency distributions from Weeks 16-18 and 20 (Week 19 was a clear outlier) via scatter plots showed that slopes ranged 0.38-1.4 and averaged 0.75, while R-squared ranged 0.92-0.99 and averaged 0.94. Please contact Senior Environmental Scientist (Specialist) Jonathan Nelson with questions about the pilot study.

### Discussion

Striped Bass catch this season was remarkable in that the male:female sex ratio (14) was far lower than last season (85) and than typical for the preceding 10 years (range=10-54; average=24), and the number of in-season recaptures was far higher than since at least 2011<sup>2</sup>. At this point we have no explanation for either matter, but we'll look into it. We suppose the sex ratio change is related to the fact that Sacramento River outflow during tagging was far greater than in many years. The exceptional number of in-season recaptures is no doubt attributable to milling behavior rather than the nature (e.g., size, age, and/or sex) or number of fish we tagged, and we suppose the milling behavior was related to exceptional Sacramento River outflow and relatively low water temperatures.

<sup>2</sup> In-season recaptures had been so rare that we started entering them into the database in 2011 and they exist only in notes prior to then. In-season recaptures this season were far greater than anyone can recall.

### Acknowledgements

We recognize and give a very special thanks to our friends at *StingRayz Beach Boardwalk and Marina* in Knights Landing. They generously allowed us to berth the *Kayot* at their marina.

We thank Mr. Jack Bailey (Reclamation District 1500) for his efforts in presenting to the trustees of Reclamation District 1500 and to local landowners our request for access to the Sacramento River through various properties. His efforts allowed us to begin our fieldwork in a timely manner.

Last but not least...we thank all personnel involved in this project. Their commitment and hard work ensured the collection of sound scientific data.

### Appendix 1. Personnel list. All were employees of the CDFW

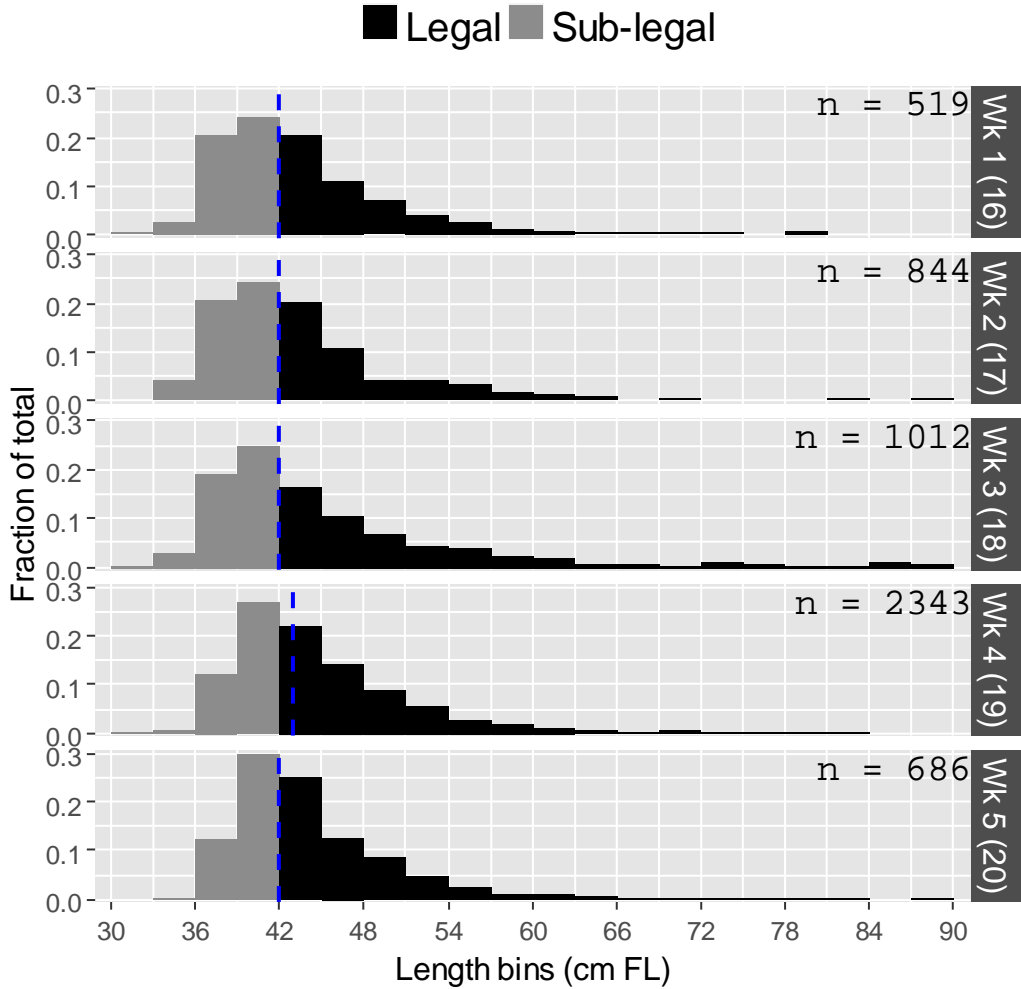
Name	Position Title
Kevin Banks	Fish & Wildlife Tech
Andrew Danos	Fish & Wildlife Tech
Mike Grady	Fish & Wildlife Tech
Dave Hull	Mate
Tim Keopadubsy	Key Data Operator
Jared Mauldin	Fish & Wildlife Tech
Matt Siepert	Fish & Wildlife Tech
Linda Warkentin	Senior Laboratory Assistant

### Appendix 2. Sequence of tags released in 2017

Tag Value	From	To	N
NR	293608	293619	12
NR	293681	293709	29
NR	293733	295737	2,005
NR	295739	295891	153
NR	295893	296314	422
\$20	Y12278	Y12278	1
\$20	Y12282	Y12283	2
\$20	Y12285	Y12379	95
\$50	F02177	F02177	1
\$50	F02181	F02182	2
\$50	F02185	F02279	95
\$100	C02185	C02279	95

NR = non-reward

**Appendix 3. Weekly length frequency distribution of Striped Bass caught (and measured) in fyke traps at Knights Landing during 2017; Notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure (n = 3, week 1; n = 7, week 2; n = 9, week 3; n = 2, week 4, n = 1, week 5), (2) vertical dashed line (blue) indicates weekly median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm, (4) number in parentheses is calendar week**



**Appendix 4. Weekly length frequency distribution of Striped Bass caught (and measured) in fyke traps near Sacramento during 2017; Notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure ( $n \leq 4$  in any given week), (2) vertical dashed line (blue) indicates weekly median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm, (4) number in parentheses is calendar week**

