

# **2016 Adult Striped Bass Tagging Cruise Report**

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

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**Cruise Dates: 12 April 2016 – 13 May 2016**

## 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 2016 Striped Bass-tagging field season.

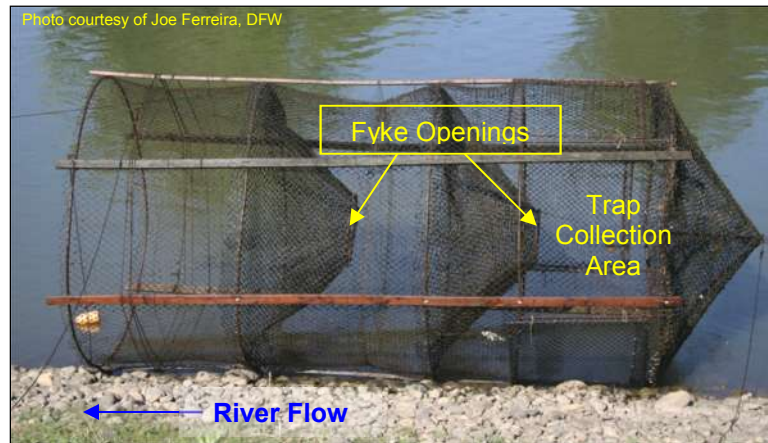
The tagging program is designed to understand and monitor the population dynamics of Striped Bass, with the ultimate goal being to provide the tools to inform science-based resource management decisions. These tools include relative and absolute abundance, harvest rate, mortality rate, individual growth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

## Methods and Gear

The crew (Appendix 1) typically included one or two Environmental Scientists, one Technician, 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). Four traps were placed on the east riverbank about two miles upstream of the Knights Landing Bridge (Highway 113). Four traps were placed on the east riverbank about one mile downstream of the Knights Landing Bridge. Traps were placed approximately 50 to 150 feet apart from each other and were secured to temporary (i.e., for the season) moorings on the levee terrace.



Traps were completely or near-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 in such a way as to facilitate easy access for tending the trap 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 tagged on board the Kayot.



Striped Bass were measured to the nearest centimeter fork length (cm FL). Most were sexed and about 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<sup>1</sup> of \$20 (example shown) or \$50.



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. Scales were collected from about 35% (N=720) 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 12-April and ended on 13-May. The late start was due to flooding of the terraces from which we must operate. The early conclusion was due to rising water temperatures that were increasingly stressful for the fish and finally exceeded a threshold established by National Marine Fisheries Service.

Field days were Monday through Friday and tagging occurred Tuesday through Friday. Field days began at 0800 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 17 days, inspected each day — except that one trap was inspected after 40 hours due to breakdown of the *Kayot* — for the presence of listed fishes, and tended 72 times. On average, traps fished 23.0 hours between inspections.

Four thousand one hundred ninety-nine (4,199) Striped Bass were caught, of which 1,901 were then tagged. One hundred sixteen (116) fish were recorded as “over” and 1,994 fish were creeled. See Table 2 for other information about recaptures and Appendix 3 for the sequence of tags applied.

<sup>1</sup> We planned to (and typically do) release \$20, \$50, & \$100 tags, but due to QA/QC issues we did not use \$100 tags this year.

**Table 1. Summary of fyke trap effort and Striped Bass catch during 2016**

	Total Caught	Total Tagged	# Traps Fished	# Traps Tended	# Days Fished
<b>Total</b>	<b>4,199</b>	<b>1,901</b>	<b>119</b>	<b>72</b>	<b>17</b>
Daily Minimum	0	0	2	0	n/a
Daily Maximum	921	411	8	8	n/a
Daily Average	247	112	7	4	n/a
Minimum/Day/Trap	0	0	n/a	n/a	n/a
Maximum/Day/Trap	586	241	n/a	n/a	n/a
Average/Day/Trap	58	26	n/a	n/a	n/a

A tended trap = fish handled and removed from the trap

Not all traps fished were tended. If the trap had few Striped Bass and no ESA species, then trap was rolled back into the water without handling fish.

Eight fish were recaptures and included just one fish from each of the three previous seasons (2012, 2013, and 2015). Tags 289622 and 291809 were re-tagged due to loose wires as a result of netting the fish out of the trap. See Table 2 for other information about recaptures.

**Table 2. Striped Bass recaptured during 2016 Striped Bass-tagging field work**

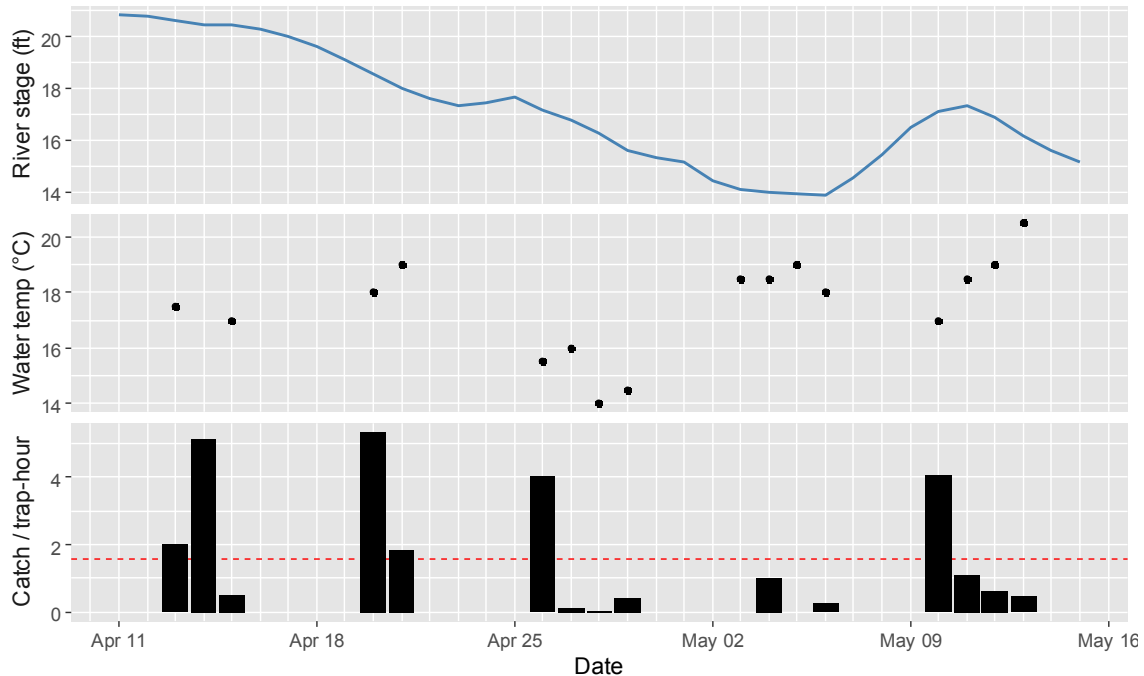
Date of Recapture	Tag Number	Date Tagged	Days at Large	Length at Tagging (cm FL)	Length at Recapture (cm FL)	Growth per Year (cm)
10-May	288445	17-May-12	1,454	83	95	3.0
4-May	289622	1-May-13	1,099	64	81	5.6
4-May	291809	24-Apr-15	376	54	57	2.9
13-May	293463	10-May-16	3	40	40	n/a
13-May	293479	10-May-16	3	38	78	n/a
6-May	292945	4-May-16	2	52	52	n/a
14-Apr	292029	13-Apr-16	1	53		n/a
14-Apr	292047	13-Apr-16	1	38		n/a

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 dropped from the beginning of the season to a season-low in week 4 (week of 02-May; Figure 1 – top panel).

Water temperature was recorded by the field crew at the beginning of each tagging day (Figure 1 – middle panel). Average water temperature was 17.5 degrees Celsius (°C, or ~ 63.5 degrees Fahrenheit) for the tagging season.

Striped Bass catch per trap-hour<sup>2</sup> by day was calculated and plotted with river stage and water temperature (Figure 1). Average catch per trap-hour for the tagging season was ~1.6 fish (represented as the dashed red line in bottom figure). Six days were above this average.

<sup>2</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.



**Figure 1. Daily Striped Bass catch per trap-hour for 2016 (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 (red) in bottom plot indicates season-average catch per trap-hour (~1.6)**

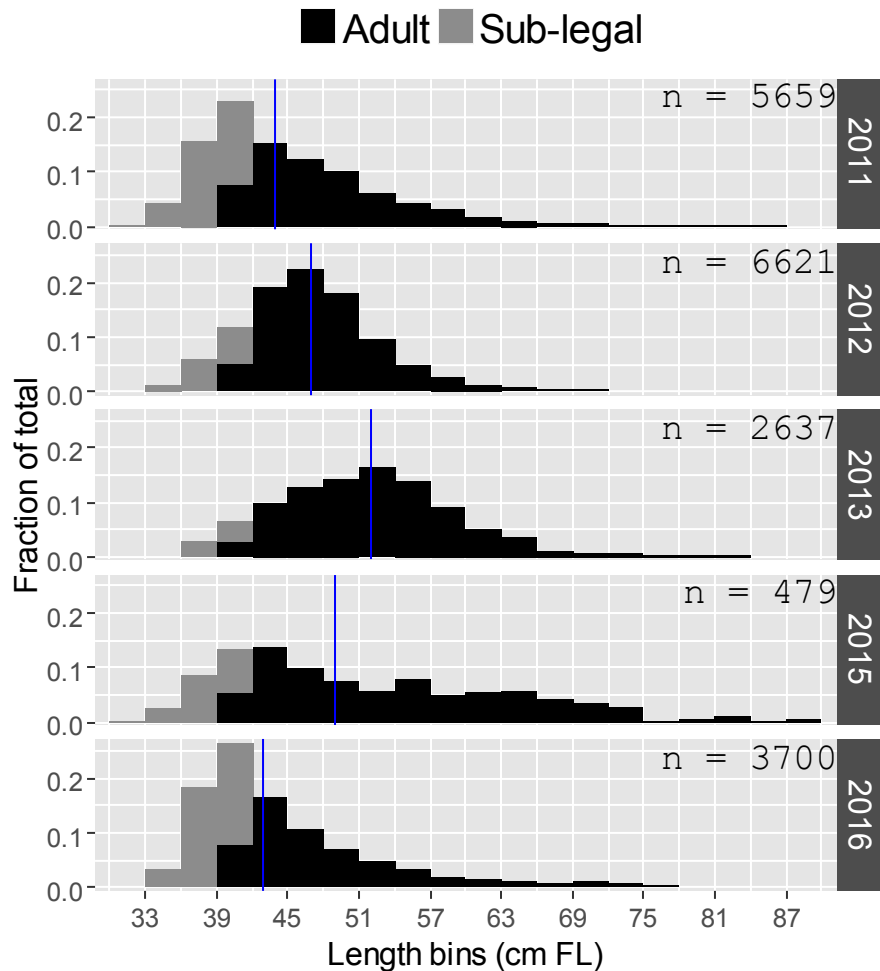
**Table 3. Weekly summary of fyke trap effort and Striped Bass catch in 2016**

<b>Week</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>
Tagged	308	304	363	237	689
Creeled / Not Tagged	358	724	332	0	580
Over	62	14	17	11	12
Dead	147	6	8	5	14
Recapture (previous and within season)	2	0	0	3	3
Weekly Total Catch	877	1,048	720	256	1,298
Number of Traps Tended	8	9	18	11	26
Number of Days Fished	3	2	4	4	4
Minimum FL (cm)	32	32	34	34	34
Maximum FL (cm)	80	75	80	96	112
Average FL (cm)	45	43	45	47	47

We creeled a large fraction of the fish we caught nearly every week, because we deployed a large number of traps relative to our ability to rapidly tag fish given staffing 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 2 for weekly variation in fork lengths.

Of the fish for which a length measurement was recorded (N=3,700), length ranged from 32 to 112 cm FL and averaged  $45 \pm 9$  cm FL ( $\pm$  SD). Of the fish for which sex was recorded (N=3,698), 3,655 were male and 43 were female (~85 males to 1 female). On average, females were larger than males ( $\text{♀} = 54 \pm 19$  cm FL,  $\text{♂} = 45 \pm 8$  cm FL).

About 40% of all Striped Bass caught (and measured) were sub-legal size (Figure 2 – bottom panel), which was an increase of about 20% from 2015 (20%) and likely attributable in large part to the fact that Sacramento River stage was exceptionally low during tagging in 2015.



**Figure 2. Length frequency of all Striped Bass collected in fyke traps from 2011-2013 and 2015-2016; notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure ( $n < 16$  per year), (2) vertical solid line (blue) indicates annual median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm**

Seven (7) Chinook Salmon were caught this season and their estimated lengths ranged 50-80 cm (Table 4). Most salmon were brightly colored, all had an adipose fin (except for one), and all were released alive in good to excellent condition.

**Table 4. By-catch of the 2016 Striped Bass tagging season**

Other Species (common name)	Scientific Name	Total Count
American Shad	<i>Alosa sapidissima</i>	214
Black Crappie	<i>Pomoxis nigromaculatus</i>	1
Channel Catfish	<i>Ictalurus punctatus</i>	88
Chinook Salmon <sup>a,b</sup>	<i>Oncorhynchus tshawytscha</i>	7
Largemouth Bass	<i>Micropterus salmoides</i>	2
Sacramento Pikeminnow	<i>Ptychocheilus grandis</i>	1
Sacramento Sucker	<i>Catostomus occidentalis</i>	3
Smallmouth Bass	<i>Micropterus dolomieu</i>	1
Spotted Bass	<i>Micropterus punctulatus</i>	6
White Catfish	<i>Ameiurus catus</i>	4
White Sturgeon <sup>a,c</sup>	<i>Acipenser transmontanus</i>	1

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

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

<sup>c</sup> Caught 12-May and estimated at 2 meters long

### Discussion

Due to substantial rain in early to mid-March, flows in the Sacramento River were more in line with what we see during a typical (i.e., non-drought) tagging season. Sustained flows likely contributed to above average catch per trap hour four out of five weeks of fishing.

About 80% percent of Striped Bass were ~30-50 cm FL, which is the largest percentage observed since we began tagging sub-legal-sized fish in 2010. This observation suggests a relatively strong recent (e.g., 2013-2014) year class despite drought conditions, substantial mortality of relatively large fish, or an uncommon migration.

For reasons that are too involved to discuss here, it has long been clear that our understanding of Striped Bass demographics can only be substantially improved if sampling effort for tagging and recapture is substantially increased. Sampling effort by the Striped Bass Population Study has been limited (and reduced) over time by staff cuts, increased work on higher priorities, and restrictions on take of listed fishes. We have for several years been attempting to mitigate this problem by soliciting what we call “complementary datasets” from other field programs. 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 — creel 5,780 Striped Bass from 16-Jan to 28-Apr 2016. 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) substantially-different male:female ratios of 85:1 (April-May by us) and 30:1 (March-April by Fisheries Branch) and (b) substantially-similar length frequency distributions during April, which was the only period the surveys were both sampling. Please contact Senior Environmental Scientist (Specialist) Jonathan Nelson with questions about the pilot study.

### **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.

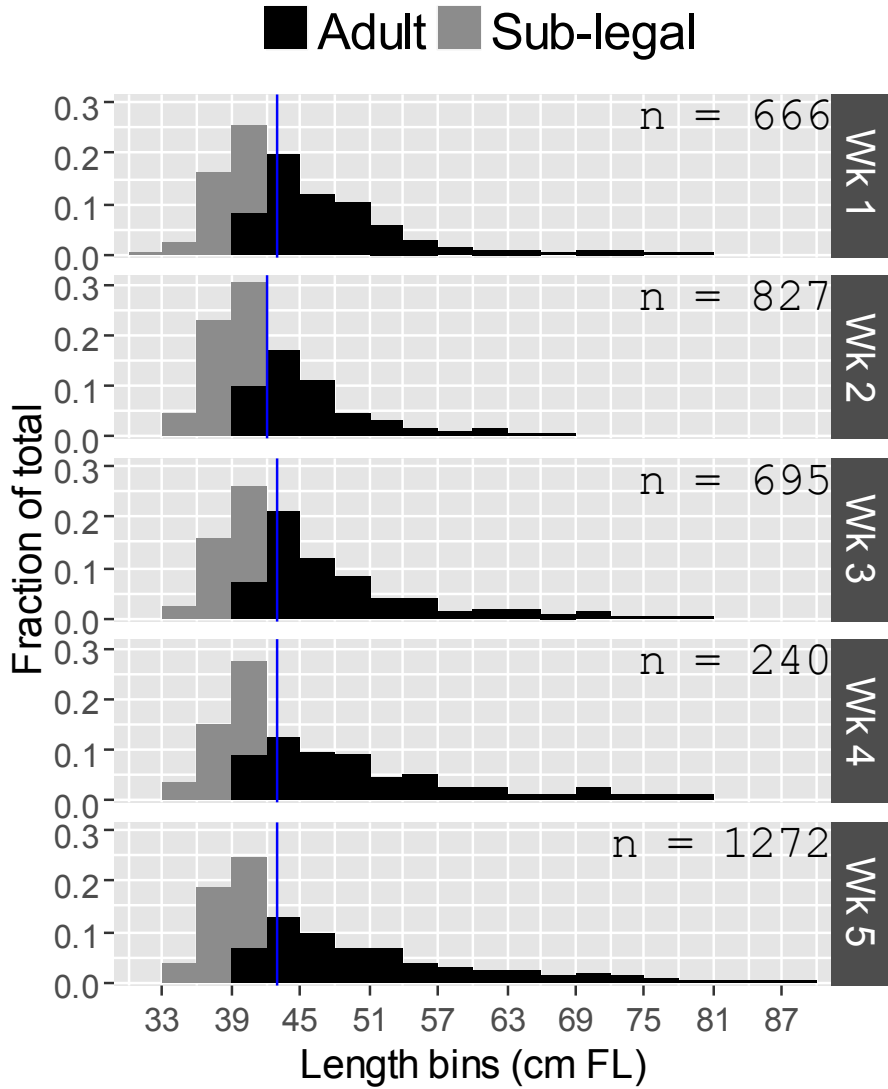
Last but not least...we thank all personnel involved in this project. Their commitment and hard work ensured the collection of sound scientific data.

### **Appendix 1. Personnel list. Except where noted in Position Title, all were employees of the California Department of Fish and Wildlife**

<b>Name</b>	<b>Position Title</b>
Alison Furler	Senior Laboratory Assistant
Andreas Raisch	Scientific Aide
Bonnie Wang	Scientific Aide
Courtney Jackson	Scientific Aide
Dave Hull	Mate
David Bridgman	Scientific Aide
Ellory Loughridge	Scientific Aide
Ethan Clark	Scientific Aide
Jared Mauldin	Fish & Wildlife Tech
Katie Smith	UC Davis doctoral candidate
Ken Flowers	Mate
Matt Siepert	Fish & Wildlife Tech
Melissa Riley	Environmental Scientist
Mike Grady	Fish & Wildlife Tech
Ramiro Soto	Mate
Randy Weinrich	Fish & Wildlife Tech
Ryan Young	Scientific Aide
Sarah Estrella	Environmental Scientist
Spencer Lewis	Fish & Wildlife Tech



Appendix 2. Weekly length frequency distribution of Striped Bass caught (and measured) in fyke traps at Knights Landing during 2016; Notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure ( $n = 1$  week 4 &  $n = 7$  week 5), (2) vertical solid line (blue) indicates weekly median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm



**Appendix 3. Sequence of tags released in 2016**

Tag Value	From	To	N
NR	291973	293098	1,126
NR	293100	293294	195
NR	293296	293415	120
NR	293417	293539	123
NR	293541	293541	1
NR	293543	293607	65
NR	293620	293680	61
NR	293710	293732	23
\$20	Y12187	Y12195	9
\$20	Y12197	Y12277	81
\$20	Y12279	Y12281	3
\$20	Y12284	Y12284	1
\$50	F02087	F02176	90
\$50	F02178	F02180	3

NR = non-reward

**Appendix 4. Weekly length frequency distribution of Striped Bass caught (and measured) in fyke traps near Sacramento during 2016; Notes: (1) for simplicity fish  $\geq 90$  cm FL not included in figure ( $n \leq 6$  in any given week), (2) vertical solid line (blue) indicates weekly median length cm FL & median includes fish  $\geq 90$  cm FL, (3) length bins by 3 cm**

