

# **2019 Adult Striped Bass Tagging Field Season Report**

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

by Andrew Danos, Jessica Chalfin, & Jason DuBois

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**Field Dates: 6 May 2019 – 7 June 2019**

## 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 2019 Striped Bass-tagging field season. For summaries of previous seasons, please see the [Striped Bass Study Bibliography](#)<sup>1</sup>.

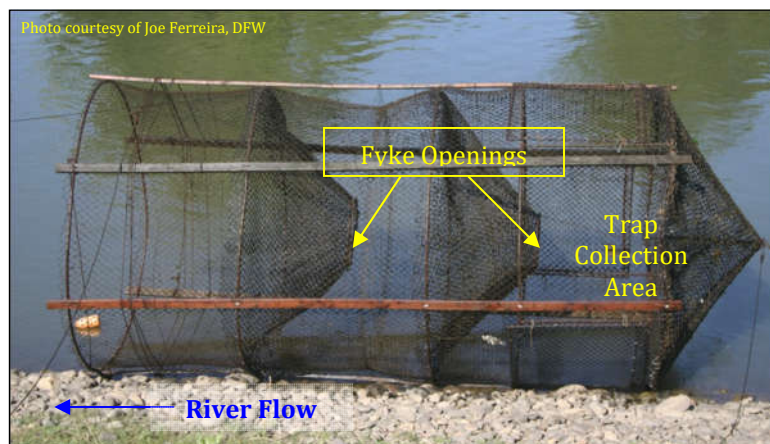
The tagging program is designed to understand and monitor the population dynamics of Striped Bass, with the goal being to provide the tools to inform science-based resource management decisions. These tools include relative and absolute abundance, harvest rate, mortality rate, individual growth rates, and large-scale movement and (or) 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 enumerated all bycatch (i.e., fish other than Striped Bass), recording approximated length, coloration, condition, and adipose fin (presence or absence) for salmonids.

## Methods & Gear

The crew (see ‘Acknowledgements’) typically included an Environmental Scientist, two 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 nine cylindrical fyke traps (length 20'; diameter 10'; 9 gauge 2¼" mesh) were fished in the Sacramento River near Knights Landing (see photo at right of a fyke trap). Five traps were placed on the west 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 250 feet apart from each other and were secured to temporary moorings on the levee terrace.



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<sup>1</sup> <https://wildlife.ca.gov/Conservation/Delta/Striped-Bass-Study/Bibliography>

Traps were completely submerged in the river while fishing (collecting fish). Striped Bass and other fishes swam through the two fyke 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 were positioned to allow relatively easy access from the research vessel (R/V) *Kayot* (~20-foot pontoon boat; see photo at right) while ensuring the trap remained in enough water to minimize fish stress.



Photo courtesy of Joe Ferreira, DFW

An electric Warn 8274 winch mounted transversely on a truck 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 R/V *Kayot*.

Striped Bass were measured to the nearest centimeter fork length (cm FL). Most were sexed and over two-thirds 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; CDFW file photo). Sex was determined by recording male for fish expressing milt, female otherwise.

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 and returned to the location of capture, and the 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 or too small to tag (<36 cm FL) were released without a tag, recorded as “over”, and added to the total catch. In a protocol we use the terms “creeling” or “creeled fish”. Creeled fish are healthy fish that could not be tagged safely due to trap or time constraints. The creeled fish were enumerated, measured, and sexed, but not tagged. This season we did not collect scales of creeled fish.

## Annual & Daily Summary

Herein we summarize 2019 effort and catch. We use both to calculate catch-per-unit-effort (CPUE).

### Effort

In 2019, we deployed fyke traps 15 days between 06-May and 07-Jun. Most days we fished with up to 9 traps, with season totals of 130 traps fished over ~3097 hours.

**Note:** On 15-May, we checked all 9 traps but did not handle fish. Catch was markedly low this day, and we did not observe any ESA species inside the nose cone of the traps. Inadvertently, we did not record the pull/end time for each trap. Thus, effort and catch “rolled” into the next tagging day (16-May).

### Catch

This season we tended between 7 and 9 traps each day (exception noted above), totaling 120. We caught 5064 Striped Bass, of which 3428 were then disc tagged. Daily (d) and daily per trap (d/t) totals and tagged (min, max, & average) are displayed below (Table 1).

**Table 1. Summary of fyke trap effort and Striped Bass catch during 2019**

	<b>Total (d)</b>	<b>Tagged (d)</b>	<b>Total (d/t)</b>	<b>Tagged (d/t)</b>
Min	95	88	1	0
Max	775	438	237	186
Avg	362	245	42	29

### Recaptures

We had 54 recaptured Striped Bass this season from 3 different tagging (release) years. Most were within season (i.e., released & recaptured the same year; for 2019 n=47).

Displayed below are all recaptured tags in 2019 (Table 2). For recaptures from previous years, we calculated growth per year (GPY) where possible. We show DateRec (date recaptured, all year 2019), DateTag (date tag released), DAL (days at large between release-recapture), and length when tagged and when recaptured (LenTag & LenRec).

**Note:** For within season recaptures, any discrepancies between LenTag and LenRec are due to inadvertent measuring and (or) recording errors.

**Note:** We recaptured five (5) Striped Bass on the same day each was tagged (not represented in Table 2).

**Table 2. Striped Bass recaptured during 2019 Striped Bass-tagging field work**

<b>TagNum</b>	<b>DateRec</b>	<b>DateTag</b>	<b>DAL</b>	<b>LenTag</b>	<b>LenRec</b>	<b>GPY</b>
294670	06-07	2017-04-27	771	42	48	2.84
294548	05-22	2017-04-26	756	43	55	5.80
295707	05-30	2017-05-04	756	32	48	7.73
C02305	05-22	2018-05-01	386	42	50	7.57
298083	05-29	2018-05-10	384	44	49	4.76
298336	06-04	2018-05-16	384	56	NA	NA
297875	05-14	2018-05-08	371	45	53	7.88
298978	05-16	2019-05-14	2	39	40	NA
300926	06-06	2019-06-04	2	50	50	NA
299204	05-17	2019-05-16	1	48	48	NA
299205	05-17	2019-05-16	1	46	46	NA
299276	05-17	2019-05-16	1	40	40	NA
299340	05-17	2019-05-16	1	39	39	NA
299571	05-22	2019-05-21	1	42	41	NA
299576	05-22	2019-05-21	1	64	65	NA
299583	05-22	2019-05-21	1	59	59	NA
299702	05-23	2019-05-22	1	49	49	NA
299712	05-23	2019-05-22	1	38	40	NA
299716	05-23	2019-05-22	1	45	50	NA
299735	05-23	2019-05-22	1	45	45	NA
299753	05-22	2019-05-21	1	41	40	NA
299757	05-22	2019-05-21	1	49	45	NA
299769	05-22	2019-05-21	1	69	69	NA
299816	05-23	2019-05-22	1	45	46	NA
299837	05-23	2019-05-22	1	42	42	NA
299852	05-23	2019-05-22	1	66	66	NA
299856	05-23	2019-05-22	1	44	45	NA
300241	05-30	2019-05-29	1	77	76	NA
300273	05-30	2019-05-29	1	52	51	NA
300276	05-30	2019-05-29	1	43	44	NA
300303	05-30	2019-05-29	1	37	37	NA
300318	05-30	2019-05-29	1	59	59	NA
300330	05-30	2019-05-29	1	52	52	NA
300415	05-30	2019-05-29	1	58	58	NA

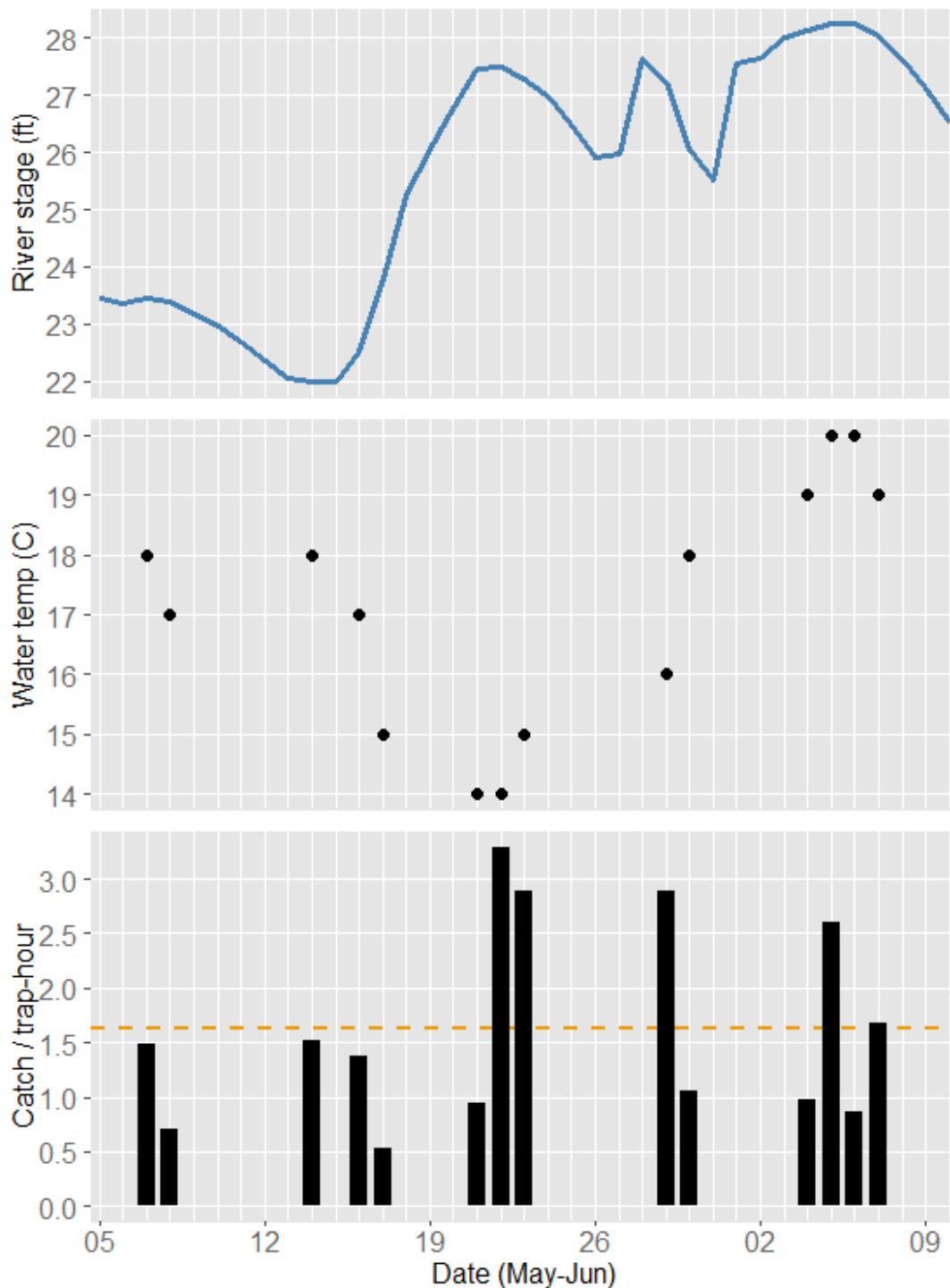
TagNum	DateRec	DateTag	DAL	LenTag	LenRec	GPY
300427	05-30	2019-05-29	1	47	47	NA
300475	05-30	2019-05-29	1	43	44	NA
300480	05-30	2019-05-29	1	38	39	NA
300550	05-30	2019-05-29	1	45	46	NA
300564	05-30	2019-05-29	1	40	40	NA
300713	06-05	2019-06-04	1	61	62	NA
300717	06-05	2019-06-04	1	45	45	NA
300927	06-05	2019-06-04	1	55	55	NA
300929	06-05	2019-06-04	1	56	56	NA
300979	06-06	2019-06-05	1	40	40	NA
301113	06-06	2019-06-05	1	50	50	NA
301169	06-06	2019-06-05	1	50	50	NA
301184	06-06	2019-06-05	1	50	50	NA
301260	06-06	2019-06-05	1	41	40	NA
301382	06-07	2019-06-06	1	50	49	NA
301450	06-07	2019-06-06	1	50	51	NA
C02468	06-07	2019-06-06	1	43	43	NA
F02410	05-23	2019-05-22	1	41	42	NA
F02457	06-07	2019-06-06	1	54	55	NA
Y12503	05-22	2019-05-21	1	64	62	NA

## Catch per Trap Hour

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 declined minimally in early May, but mid-May rains maintained steady levels between ~25 and 28 feet for the season's duration (Figure 1 – top panel).

Water temperature was recorded by the field crew at the beginning of each tagging day at approximately 07:30 AM. Average water temperature was 17.1 degrees Celsius (°C, or ~62.9 degrees Fahrenheit) for the tagging season (Figure 1 – middle panel).

Striped Bass catch per trap-hour by day was calculated and plotted with river stage and water temperature. Average catch per trap-hour for the tagging season was ~1.6 fish (Figure 1 – bottom panel; average denoted with orange dashed line).



**Figure 1. Daily Striped Bass catch per trap-hour for 2019 (bottom) with daily average river stage at Knights Landing (top) and daily water temperature (middle); note: dashed-line (orange) in bottom plot indicates season-average catch per trap-hour (~1.6)**

## Weekly Catch

Displayed below (Table 3) are weekly numbers for total caught (and then parsed by tagging action: tagged; creeled; over; dead; recaptured), traps tended, and days fished. Despite a moderate week 1, we tagged hundreds of Striped Bass each week.

**Note:** Days fished does not include 15-May (week 2), as on that day we checked each trap but did not handle fish. In week 2, we fished 4 days.

**Table 3. Weekly summary of fyke trap effort and Striped Bass catch in 2019**

Week	Total	Tagged	Creeled	Over	Dead	Recapture	TrapsTended	DaysFished
1	342	337	0	5	0	0	14	2
2	1055	838	181	27	3	6	27	3
3	1466	722	691	35	0	18	26	3
4	935	606	294	19	2	14	18	2
5	1266	925	283	38	4	16	35	4

Below (Table 4) we display weekly length measurement stats. N denotes number of Striped Bass measured (includes both sexes). Var is the variance around the mean (Avg). We do not observe much week-to-week variation in mean fork length.

**Table 4. Weekly summary of Striped Bass catch measurements in 2019**

Week	N	Min	Max	Avg	Med	Var
1	336	35	104	46.6	45	70.2
2	1021	34	88	47.4	46	72.0
3	1426	32	114	47.4	46	89.4
4	915	31	85	46.9	45	73.2
5	1221	33	94	46.8	45	76.4

## Sex Ratio

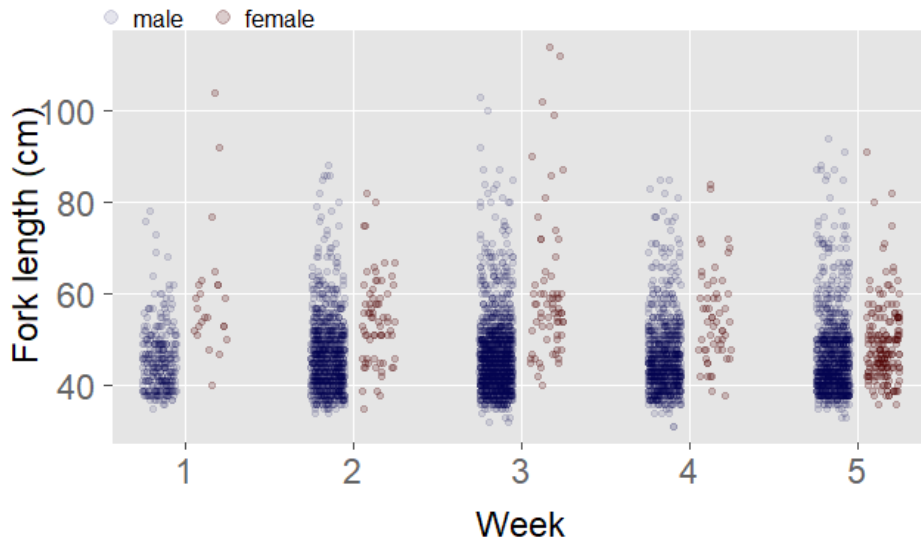
Below (Table 5) we display the sex ratio along with fork length statistics by sex. The ratio is skewed noticeably towards males (M). On average, females (F) were larger than males, but we observed much greater variance (Var) in female lengths than in male lengths. NAll represents total catch and N is number of individuals measured. Sex U is unknown (i.e., not recorded).

**Table 5. Striped Bass sex ratio in 2019**

Sex	Ratio	NAll	N	Min	Max	Avg	Med	Var
M	0.891	4513	4509	31	103	46.548	45	69.286
F	0.079	399	399	35	114	53.546	51	134.942
U	0.030	152	11	38	62	47.364	45	83.055



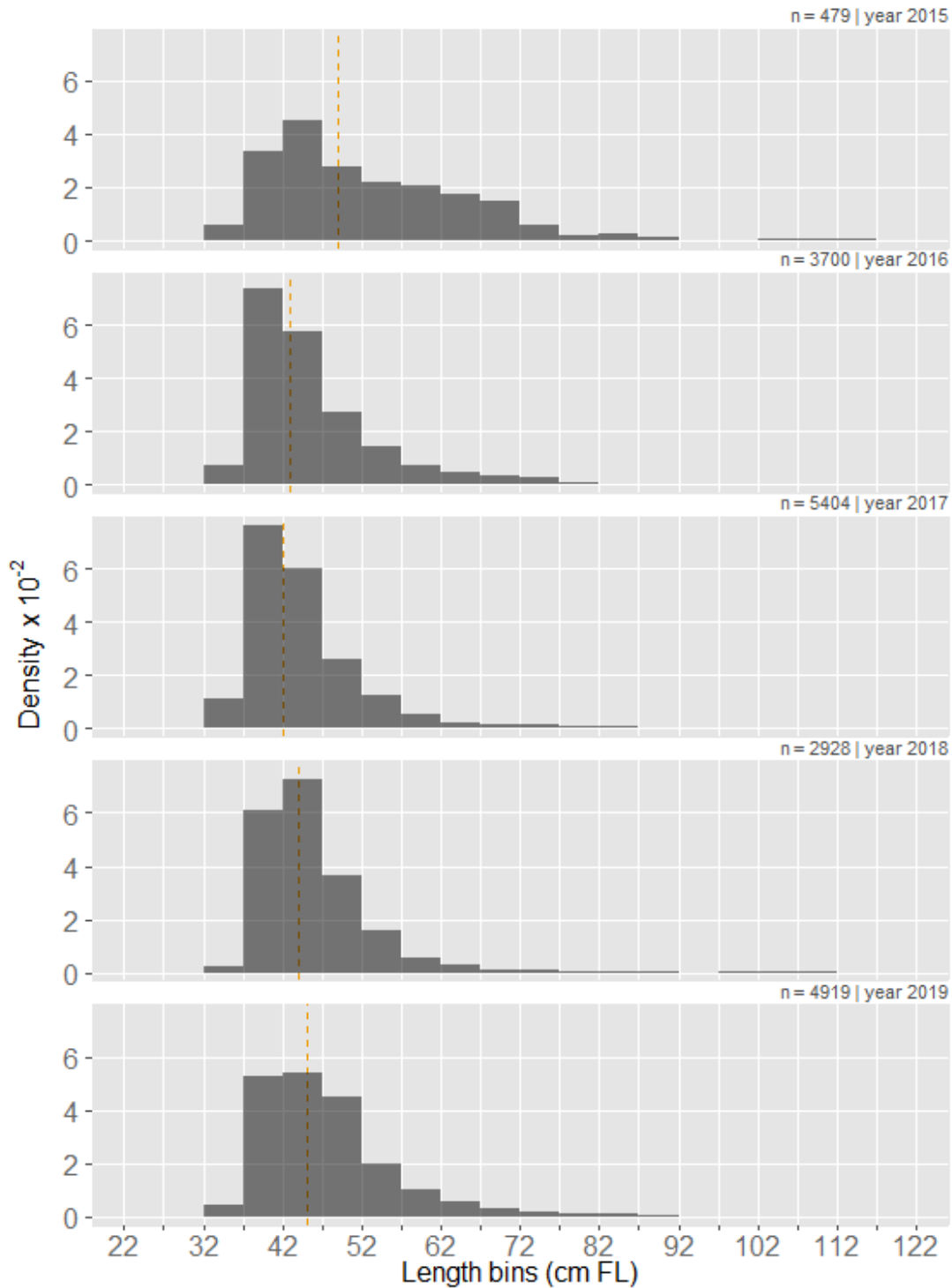
Below (Figure 2) we display weekly length distributions by sex. Each point is one Striped Bass, and 'noise' has been added to reduce over-plotting. We note (1) some of the largest fish this season appeared in week 3 and (2) more females were observed in week 5 than in each of the previous four weeks.



**Figure 2. Weekly fork length distributions by sex for Striped Bass catch in 2019**

### Length Frequency

Of the fish for which length was recorded ( $n=4919$ ), length ranged 31-114 cm FL and averaged  $47.1 \pm 8.8$  cm FL ( $\pm$  SD). Below (Figure 3) we display annual length frequency distributions from 2015 to 2019. The vertical dashed line (orange) denotes median length. Length bins are 5 cm, and all bars left of bin 42 denote sub-legal sized fish. The fraction of sub-legal sized fish has varied annually: 0.196 (2015); 0.405 (2016); 0.440 (2017); 0.315 (2018); 0.286 (2019).



**Figure 3. Length frequency of all Striped Bass collected in fyke traps from 2015-2019; notes: (1) vertical dashed line (orange) indicates annual median length cm FL, (2) length bins are by 5 cm**

## Bycatch

We caught 11 different non-targeted (i.e., bycatch) species this season. By far the largest fraction was American Shad (0.945). We caught 5 Chinook Salmon with approximated lengths between 50 and 67 cm. All salmon were released alive, most in excellent condition. Below are seasonal (2019) by-catch totals (Table 6).

**Note:** The White Sturgeon was caught 17-May and measured ~139 cm FL.

**Table 6. By-catch of the 2019 Striped Bass tagging season**

Species	Scientific Name	Count
American Shad	<i>Alosa sapidissima</i>	1090
Black Crappie	<i>Pomoxis nigromaculatus</i>	7
Channel Catfish	<i>Ictalurus punctatus</i>	28
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	5
Hardhead	<i>Mylopharodon conocephalus</i>	1
Sacramento Pikeminnow	<i>Ptychoceilus grandis</i>	3
Sacramento Sucker	<i>Catostomus occidentalis</i>	3
Spotted Bass	<i>Micropterus punctulatus</i>	14
Tule Perch	<i>Hysterocarpus traskii</i>	1
White Catfish	<i>Ameiurus catus</i>	1
White Sturgeon	<i>Acipenser transmontanus</i>	1

## 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.

Jeremiah Bautista; Rebecca Heisey; David Hull; Tim Keopadubsy; Tim Malinich; Jared Mauldin; Harrison Morrow; Devin Vlach; and James White

## Tag Sequence

Below (Appendix 1) we display the sequence of tags (by value) and count (N) released this season (2019). NR denotes non-reward. Roughly about 10% of tags released are reward tags.

### *Appendix 1. Sequence of disc tags released in 2019*

<b>Tag Value</b>	<b>From</b>	<b>To</b>	<b>N</b>
NR	298388	298389	2
NR	298448	298778	331
NR	298780	299041	262
NR	299043	299545	503
NR	299547	299619	73
NR	299621	300545	925
NR	300547	300619	73
NR	300621	301003	383
NR	301005	301057	53
NR	301059	301065	7
NR	301067	301366	300
NR	301368	301442	75
NR	301444	301539	96
\$20	Y12460	Y12574	115
\$50	F02357	F02357	1
\$50	F02360	F02473	114
\$100	C02359	C02473	115