

# **2016 Field Season Summary for the Sturgeon Population Study**

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

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**Field Season: 14 September 2016 – 27 October 2016**

## Introduction

A sturgeon population study conducted by the California Department of Fish and Wildlife (CDFW) has been ongoing intermittently since 1967 (annually since 2005). Part of the study is a “high-value reward” tagging program. Presented here is a summary of the 2016 sturgeon-tagging field season. For summaries from previous seasons, please click [Bibliography](#).

The population study is designed primarily to understand and monitor the fishery for and population dynamics of White Sturgeon (*Acipenser transmontanus*) is also used to monitor aspects of the Green Sturgeon (*A. medirostris*) population. The tagging portion of the population study provides data on relative and absolute abundance, harvest rate, mortality rate, individual growth rates, and large-scale movement/migration patterns.

Our primary objective during the 2016 field season was to capture, tag, measure, and release in good condition as many White Sturgeon as possible and to document previously-tagged sturgeon. In an on-going collaboration with United States Fish and Wildlife Service (USFWS) and with the San Francisco Estuary Institute, this season USFWS staff were also on-board to collect various sturgeon tissues as part of an age-and-growth study and a study monitoring Selenium concentrations in White Sturgeon. USFWS staff also monitored for acoustic transmitter tags (not reported here).

## Methods

Our field season began 14 September 2016 (later than usual, due limited staff and boats) and ended 27 October 2016. We captured sturgeon using trammel nets deployed from the CDFW research vessels *Striper II* and *New Alosa* (both vessels fishing in Suisun Bay).

We continued the two major alterations to our sampling methodology, which we implemented to decrease interactions with marine mammals and improve the condition of captured fish: (1) reduced the length of net in the water from 200 fathoms (~366 m) to 100 fathoms (~183 m) and (2) decreased soak time from about 45 minutes to about 30–35 minutes.

The *New Alosa* is a 42-foot West Coast-style combination-type fishing vessel with a 610 hp Volvo engine capable of cruising at 17 knots, and the *Striper II* is a 32-foot Southeast Alaska-style gillnetting vessel with a 6-V 53 Detroit Diesel engine capable of 7.5 knots. For the 2016 season, the *New Alosa* was berthed at the *New Bridge Marina (Antioch, CA)* and the *Striper II* was berthed at the *Martinez Marina*. Each vessel had a crew of 3-4 people including a boat operator and biological staff.

Both vessels were equipped with one 100-fathom (~183 m) trammel net, one hydraulic net reel, one resuscitation tub, and one tagging station. The boat operator typically ran the boat, operated the net hydraulics, and extracted fish from the net upon retrieval. The deckhand tended the net during deployment and assisted the boat operator by removing fish and debris from the net. The scientific aide and biologist measured and

tagged sturgeon, recorded bycatch, collected biological data/samples, and assisted with boat duties as needed.

The 100-fathom net was comprised of four contiguous 25-fathom (45.7 m) long by 2-fathom (3.7 m) deep sections. Each 25-fathom section was made up of a gillnet panel between two panels of trammel net. The gillnet was an Alaska salmon-style webbing made up of multi-strand monofilament twist. The trammel net was made up of three multi-strand twisted nylon braids. The diagonal dimension of the gillnet mesh varied by 25-fathom net section and was assembled in the following order: 8", 7", 6", and 8". On the *Striper II*, one 8" panel was replaced with a 6" panel (21-Sep) and remained that way for the duration of the season.

Nets were set in locations selected by the boat operator to avoid known snags and (when possible) to target signs of sturgeon aggregations (e.g., many jumping sturgeon). The net was deployed across the stronger of the prevailing current or wind and took approximately five minutes to set. The deployed net was continuously monitored to detect snags, tangles, and marine mammal interactions, as well as to avoid conflicts with other vessels, channel markers, and other hazards. The nets were set as many times as possible (usually 4-6) in a given workday.

Data collected during each net set included (1) the time of the start and end of the net set/retrieve, (2) the latitude/longitude of the start of the net set, (3) the water temperature, (4) the number of pinnipeds in the vicinity of and raiding the net, (5) any vessel interactions, and (6) the weather conditions (based on the Beaufort scale).

Each sturgeon brought on a vessel was to be immediately removed from the net and either carefully placed in the tagging cradle or placed in a plastic tub filled with water pumped from the bay. Sturgeon were placed in the tub only when processing could not be completed in a timely manner (e.g., when several came on-board from the same small section of net).

We checked each sturgeon for old tags (i.e., PIT, disc, etc.) and evidence of a shed or clipped tag, recorded fork length to the nearest centimeter (cm FL), attached a disc-dangler (Petersen) to White Sturgeon 80-217 cm FL, and assessed overall condition/stress level (good, fair, or poor). The tag was placed in the flesh just below the base of the dorsal fin, midway between the anterior and



posterior ends of the fin (see photo previous page, courtesy of Harry Morse). Each tag was labeled with a reward value of \$50, \$100, or \$150 (see Appendix 1), which — in an effort to improve the accuracy of harvest rate estimates by increasing the willingness of anglers to contact us about recapture of tagged fish — is a change from recent rewards values of \$20, \$50, or \$100.

Fish showing an unusually high level of stress and/or trauma (e.g., lack of “gilling”, lack of vigor) were placed in the plastic holding tub for resuscitation and released without a tag as soon as their condition appeared to improve. We checked all sturgeon for signs of having shed a tag — defined as a captured sturgeon that did not have a tag and did not show an obvious sign of having been tagged (i.e., wires present), but did exhibit open sores or scars at the location of tagging.

USFWS staff collected biological samples from White Sturgeon that were 66-217 cm FL. Samples were only taken from the first five White Sturgeon of each size category caught. Each sampled White Sturgeon was immediately returned to the water after a small clip was taken of the marginal pectoral fin ray close to the base of the fin, a blood sample was drawn from the caudal artery, and/or 1-3 muscle plugs were taken from the area just posterior to the dorsal fin.

Bycatch was identified to species, counted, and released as quickly as possible. In addition, Chinook Salmon<sup>1</sup> and California Halibut were measured. We noted all marine mammals (Pacific harbor seals and California sea lions) observed within 50 meters of the net and instances of a marine mammal observed raiding the net (i.e., eating or appearing to eat a fish in or taken from the net).

Catch per unit effort (CPUE) was calculated to estimate daily and monthly relative abundance and to compare annual estimates of relative abundance for White Sturgeon. Catch was calculated as the sum of all newly-tagged fish, recaptured fish, and non-tagged fish. The unit of effort was 100 net-fathom hour, which is equivalent to a net 100 fathoms long fishing for one hour. Effort was calculated by weighting the soak time (i.e., the amount of time between the end of the net set and the beginning of the net retrieve) by 100% and the amount of time for the net deployment and the net retrieval by 50%.

## Results

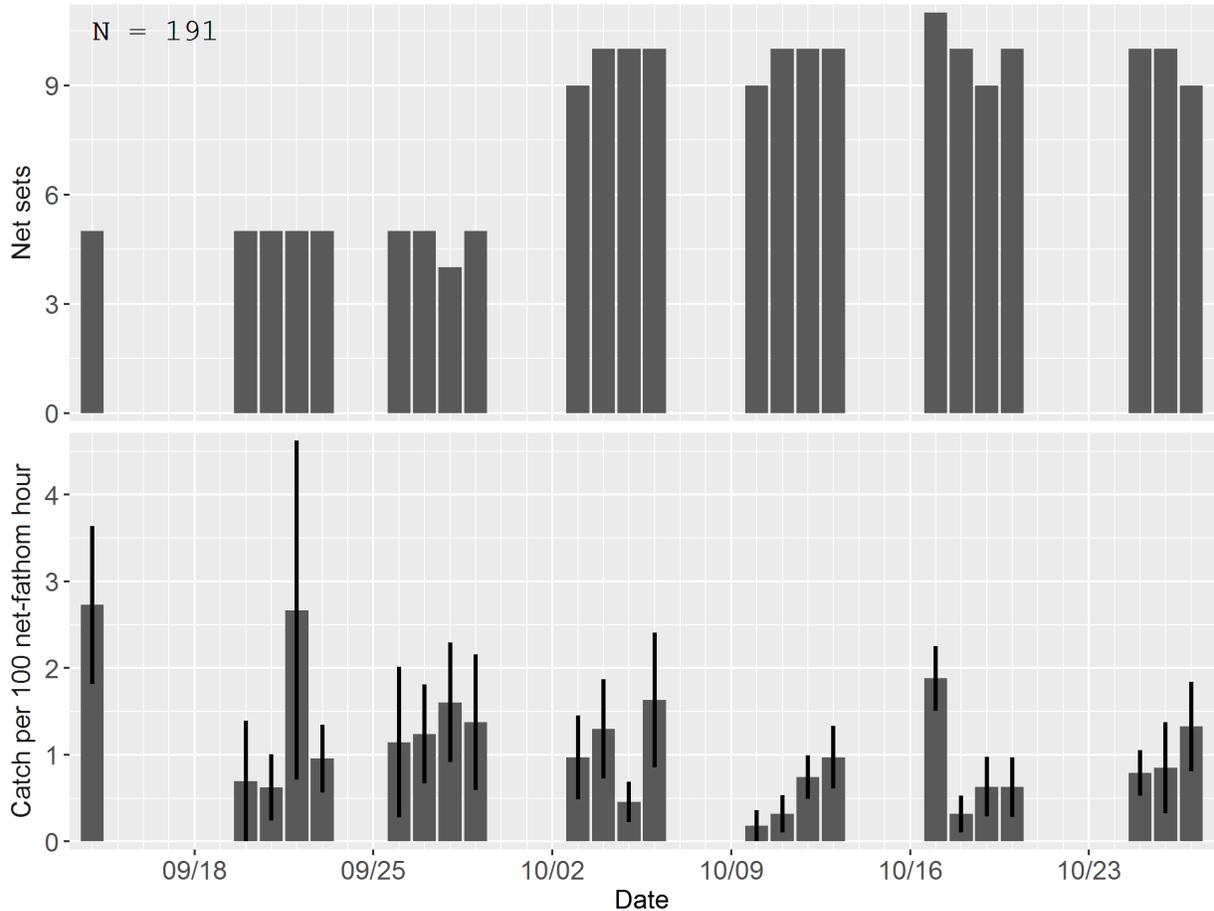
All fishing effort and catch was in Suisun Bay (see Appendix 2). We set the net 191 times during 39 boat-days (24 calendar days) for a total of 144 hours of fishing time (~12,110 net-fathom-hours). Average fishing time per set was about  $45 \pm 4.9$  (SD) minutes. Nets were set an average of 5 times per day per boat.

One hundred twenty-one (121) White Sturgeon and zero (0) Green Sturgeon were captured. Of the White Sturgeon captured, 74 were then tagged. We did not recapture previously tagged sturgeon, except that we recaptured two newly-tagged sturgeon in the following set.

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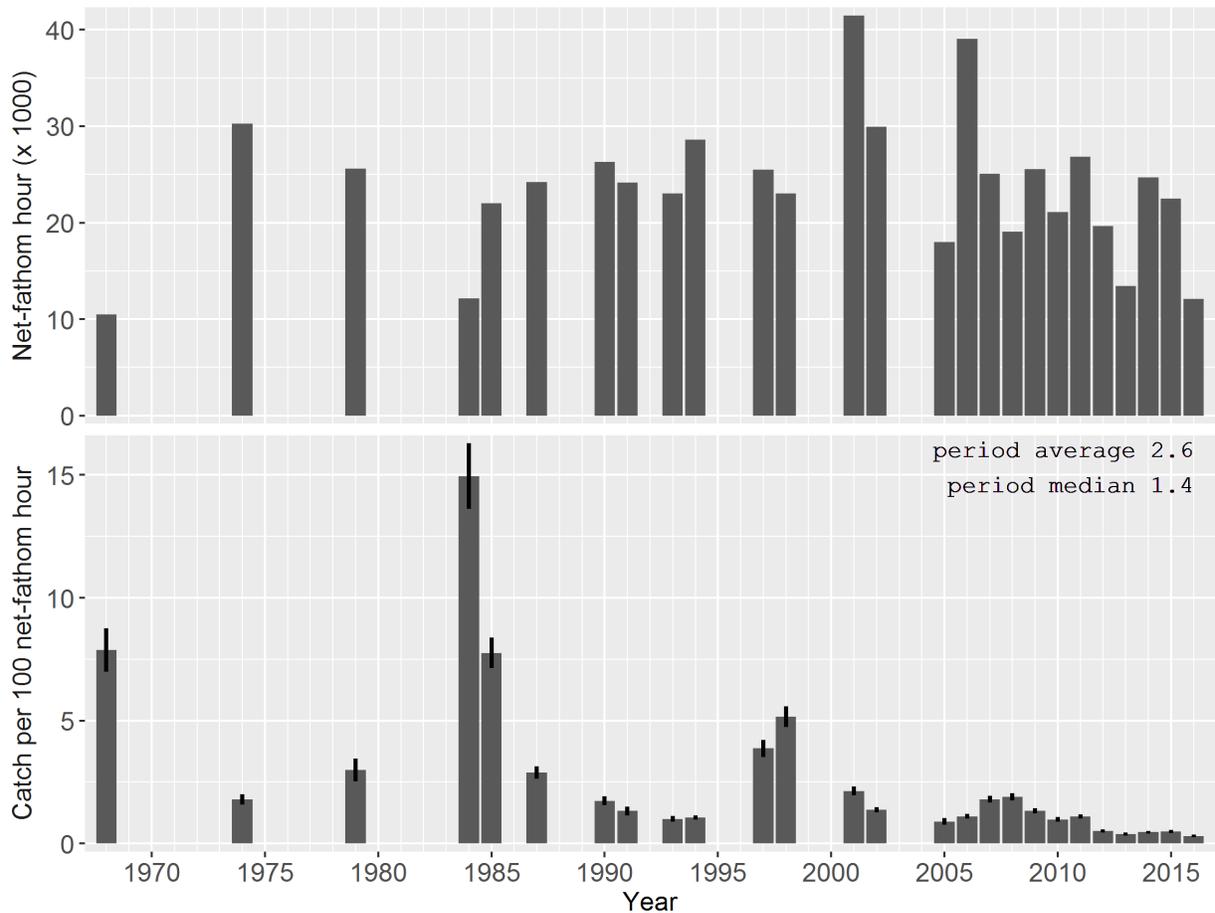
<sup>1</sup> For salmon, we also recorded condition, coloration, and presence/absence of adipose fin

Average daily CPUE for legal-sized (102-152 cm FL) White Sturgeon was  $0.30 \pm 0.02$  (SE) and for all sizes of White Sturgeon was  $1.07 \pm 0.05$  (SE). Average daily CPUE per drift (net set) for all sizes of White Sturgeon was greatest on 14-Sep ( $2.73 \pm 0.91$  (SE); Figure 1).



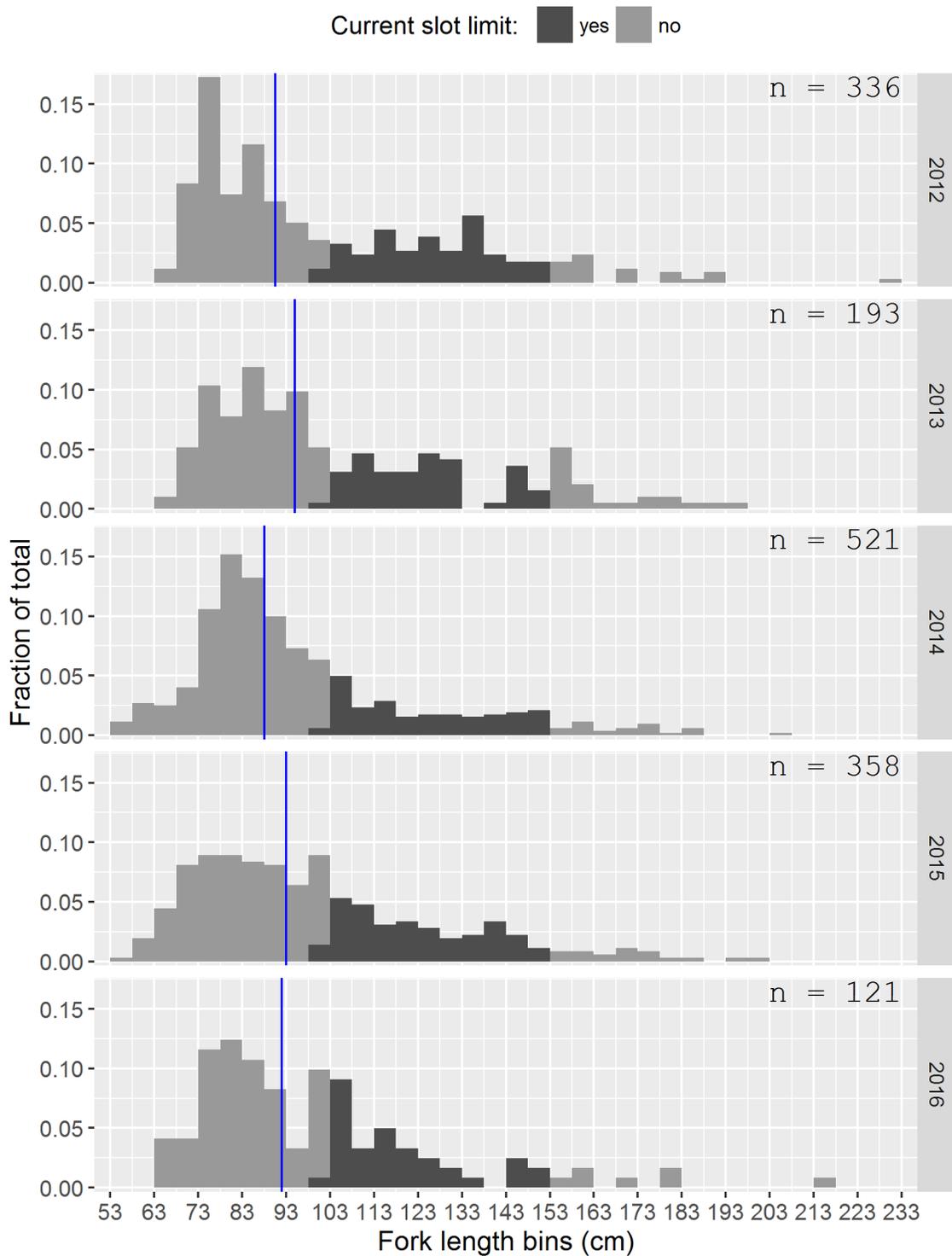
**Figure 1. (top) Number of net sets each day, (bottom) White Sturgeon average catch per 100 net-fathom hour  $\pm 1$  SE of all net sets that day; Note: date shown = Sunday (year = 2016)**

Average monthly CPUE for all sizes of White Sturgeon was 1.4 in September and 0.9 in October. Catch per 100 net-fathom hour of White Sturgeon within the current slot limit (102-152 cm FL) was  $0.31 \pm 0.05$  (SE), a value well below the historical (period) average of 2.6 (Figure 2).



**Figure 2. (top) Annual fishing effort (as net-fathom hour [NFH]), (bottom) Average catch per 100 net-fathom hour  $\pm$  1 SE (using all net sets) of White Sturgeon within current slot limit (102–152 cm FL) captured during CDFW sturgeon population study tagging operations**

The 2012-2016 White Sturgeon length frequency distributions show (1) strong cohorts (from mid-to-late 1990s) within the legally-harvestable size range have substantially diminished, (2) the progression of the strong 2006 cohort toward harvestable size, and (3) early signs that what should be a modest 2011 cohort is recruiting to the nets (Figure 3).



**Figure 3. White Sturgeon length frequency distribution (as percent of total catch per year) for years 2012–2016; blue vertical line indicates annual median fork length; bins by 5 cm**

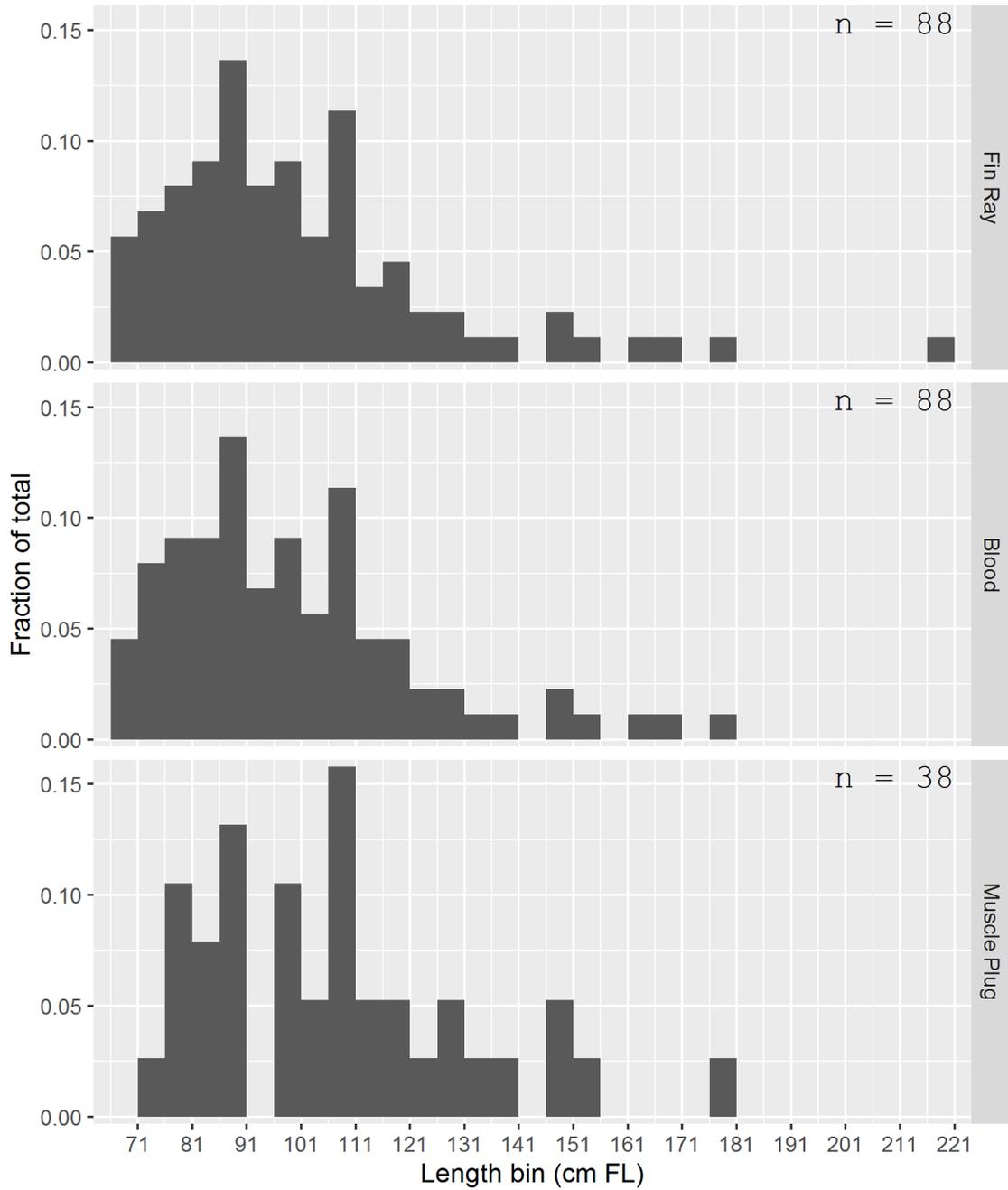
No bycatch was retained. Chinook Salmon (N=46 total; N=46 length approximated) ranged 56-97 cm FL and averaged 72 cm FL. (Note: Lengths of Chinook Salmon were approximated in order to return these fish to the water quickly.) California Halibut (N=11 total; N=8 length recorded) ranged 45-79 cm TL and averaged 55 cm TL. No other bycatch were measured.

**Table 1. Numbers of other species caught (bycatch) during the 2016 sturgeon tagging season**

Bycatch Species	Scientific Name	Suisun Bay	Percent of Total
California Halibut	<i>Paralichthys californicus</i>	11	9.9%
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	46	41.4%
Diamond Turbot	<i>Hypsopsetta guttulata</i>	4	3.6%
Dungeness Crab	<i>Metacarcinus magister</i>	1	0.9%
Starry Flounder	<i>Platichthys stellatus</i>	41	36.9%
Striped Bass	<i>Morone saxatilis</i>	8	7.2%
<b>Total</b>		<b>111</b>	

We observed an average of 1.8 ( $\pm$  1.1 SD) sea lions and 0.02 ( $\pm$  0.14 SD) seals within 50 meters of the net, we observed sea lions raiding the net during 59% of the sets, and we never observed a seal raid the net.

USFWS staff collected fin clips, blood samples, and/or muscle plugs from 93 White Sturgeon with fork lengths 66-217 cm FL (Figure 4).



**Figure 4. Length frequency distribution of biological samples (Fin Ray, Blood, and Muscle Plug) collected from White Sturgeon during 2016 tagging operations; bins by 5cm**

## Acknowledgments

We thank the *Martinez Marina* for providing a berth to the *Striper II* for the season.

For their dedication and hard work, we thank the following personnel:

<b>Affiliation</b>	<b>Name</b>	<b>Position</b>
<i>CDFW</i>	Kevin Banks	F & W Technician
	Jeremiah Bautista	Environmental Scientist
	David Bridgman	Scientific Aide
	Andrew Danos	F & W Technician
	Ken Flowers	Mate
	Steve Gonzales	Public Information Officer
	Mike Grady	F & W Technician
	David Hull	Mate
	Ryan Kok	Senior Laboratory Assistant
	Spencer Lewis	F & W Technician
	Jared Mauldin	F & W Technician
	Aaron Ngo	Senior Laboratory Assistant
	Brynn Perales	Scientific Aide
	Matt Siefert	F & W Technician
	Ramiro Soto	Mate
Ryan Young	Scientific Aide	
<i>Univ of Idaho</i>	Shannon Blackburn	Graduate Student
<i>USFWS</i>	Garrett Giannetta	Biological Science Technician
	Laura Heironimus	Fish Biologist
	Zachary Jessee	Biological Science Technician
	Graham Mytton	Biological Science Technician
<i>Guest</i>	Gregory Forkes	

**Appendix 1 (Tag numbers released in 2016)**

Value	From	To	N
\$50	FF2300	FF2314	15
	FF2330	FF2339	10
\$100	HH2300	HH2314	15
	HH2330	HH2339	10
\$150	HF2300	HF2314	15
	HF2330	HF2338	9

**Appendix 2 Spatial and temporal (monthly) catch of White Sturgeon (WST) per net set per vessel in 2016**

