

2015 Field Season Summary for the Sturgeon Population Study

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

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Field Season: 06 August 2015 – 22 October 2015

Introduction

A sturgeon population study conducted by the California Department of Fish and Wildlife 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 2015 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*), but has increasingly been 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 2015 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 USFWS and a new collaboration with 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 69Khz acoustic transmitter tags.

Methods

Our field season began 06 August 2015 and ended 22 October 2015. We captured sturgeon using trammel nets deployed from the CDFW research vessels *Striper II* (fishing in Suisun Bay) and *New Alosa* (fishing in San Pablo Bay or 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. The *New Alosa* was berthed at the *Vallejo Municipal Marina*, 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. Typically one of the biological staff would assist the boat operator in the releasing and retrieval of the nets.

Both vessels were equipped with one 100-fathom (~183 m) trammel net, one hydraulic net reel, one resuscitation tub, and one tagging station. Typically, the boat operator 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 upon retrieval. 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".

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 and end of the net set/retrieve, (3) the water temperature, (4) the number of pinnipeds patrolling 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 86-200 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 at right, 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 technicians collected biological samples from White Sturgeon that were 53 to 200 cm FL and from Green Sturgeon. 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. USFWS also monitored for and noted the occurrence of signals from 69Khz acoustic tags.

Bycatch was identified to species, counted, and released as quickly as possible. In addition, Chinook Salmon¹ and California Halibut were measured, and sharks and rays were measured and sexed. 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

Nearly all fishing effort and catch was in Suisun Bay (see Appendix 2). We set the net 348 times during 71 boat-days (41 calendar days) for a total of 267 hours of fishing time (~22,500 net-fathom-hours). Average fishing time per set was about 46 ± 6.5 (SD) minutes. Nets were set an average of 5 times per day per boat.

Three hundred fifty-nine (359) White Sturgeon and 18 Green Sturgeon were captured. Of the White Sturgeon captured, 190 were then tagged, one had been tagged in 2014, and one had been tagged this season. We tagged no Green Sturgeon.

¹ 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 0.5 ± 0.1 (SE) and for all sizes of White Sturgeon was 1.6 ± 0.1 (SE). Average daily CPUE per drift (net set) for all sizes of White Sturgeon was greatest on 12-Aug (4.7 ± 1.3 (SE); Figure 1).

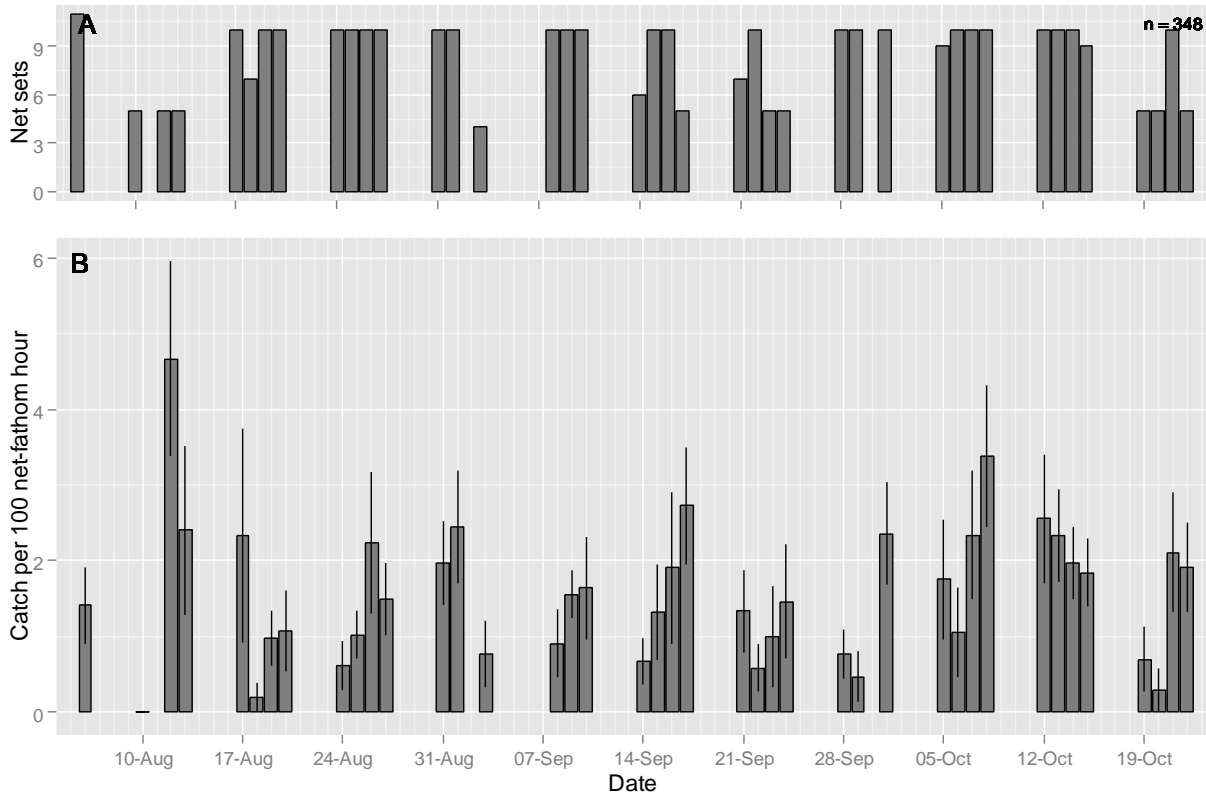


Figure 1. (A) Number of net sets each day, (B) White Sturgeon average catch per 100 net-fathom hour ± 1 SE of all net sets that day (average was zero only on 10-Aug); Note: date shown = Monday (year = 2015)

Average monthly CPUE for all sizes of White Sturgeon ranged from 1.3 (Sep) to 2.0 (Oct). Catch per 100 net-fathom hour of White Sturgeon within the current slot limit (102-152 cm FL) was 0.49 ± 0.06 (SE), a value well below the historical average of 2.7 (Figure 2).

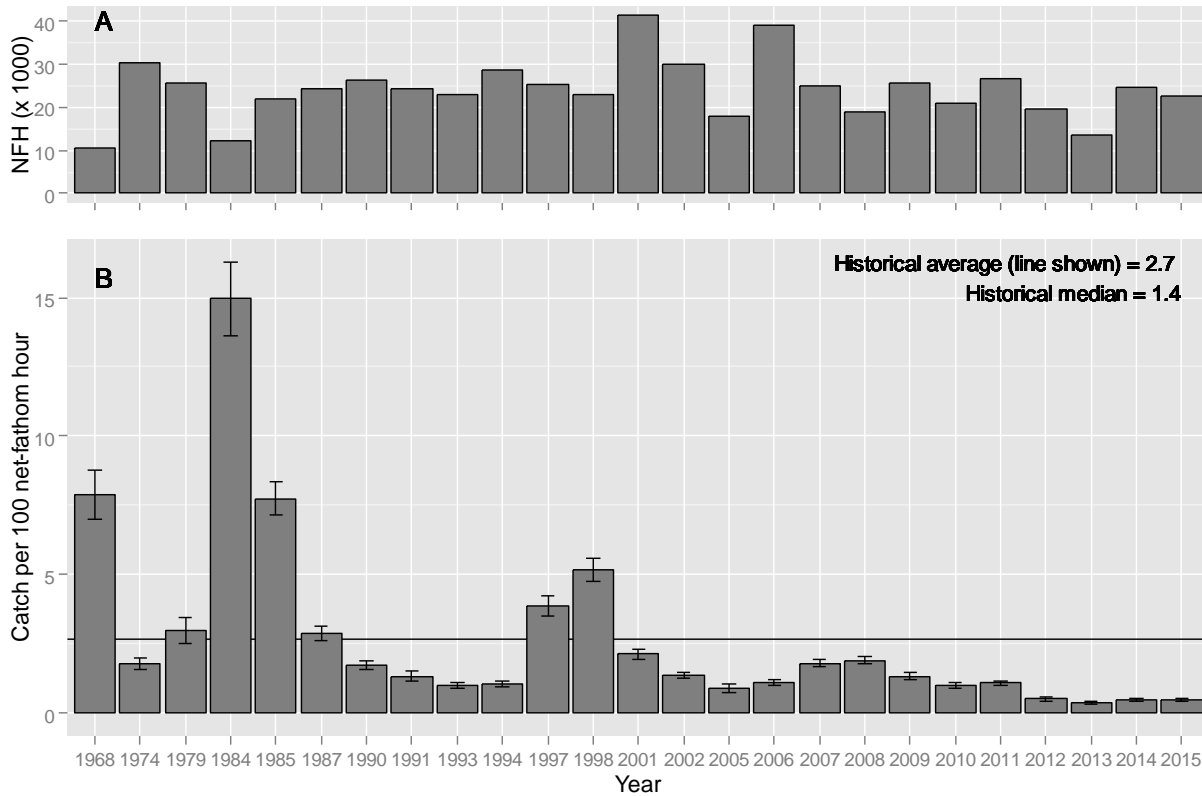


Figure 2. (A) Annual fishing effort (as net-fathom hour [NFH]), (B) Average catch per 100 net-fathom hour \pm 1 SE (using all net sets) of White Sturgeon within current slot limit (102–152 cm FL) captured during CDFW sturgeon population study tagging operations

Green Sturgeon ranged 55-129 cm FL and the average was 76 ± 23 (SD) cm FL. Twelve Green Sturgeon were captured in August (N=4, San Pablo Bay; N=8, Suisun Bay), three were captured in September (all from Suisun Bay), and three were captured in October (all from Suisun Bay).

The 2011-2015 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).

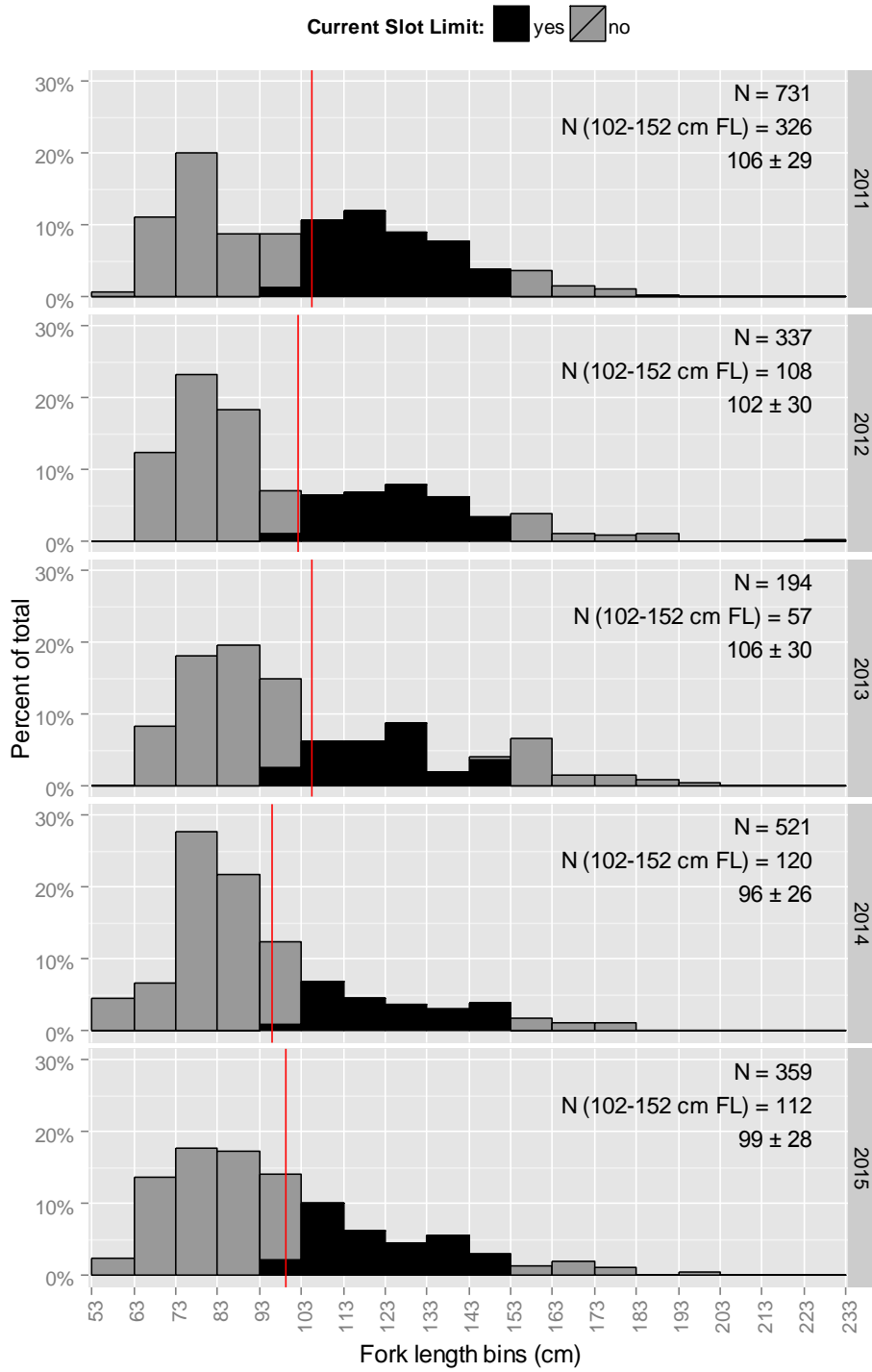


Figure 3. Length frequency distribution (as percent of total catch per year) of White Sturgeon for years 2011–2015; red line indicates average (also included as average ± SD on right side of plot); number within the current legal harvest size (102-152 cm FL) included for reference

No bycatch was retained. Bycatch was more diverse in San Pablo Bay (Table 1), but — in what was no doubt due to a shift in fish distribution associated with the drought — we caught Bay Rays in Suisun Bay for the first time. Chinook Salmon (N=57 total; N=57 length approximated) ranged 56-103 cm FL and averaged 76 cm FL. (Note: Lengths of Chinook Salmon were approximated in order to return these fish to the water quickly.)

Table 1. Numbers of other species caught (bycatch) during the 2015 sturgeon tagging season

Bycatch Species	Scientific Name	San Pablo Bay	Suisun Bay	Total	Percent of Total
Bat Ray	<i>Myliobatis californica</i>	47	2	49	28.2%
Brown Smoothhound	<i>Mustelus henlei</i>	1	0	1	0.6%
California Halibut	<i>Paralichthys californicus</i>	2	2	4	2.3%
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	0	57	57	32.8%
Common Carp	<i>Cyprinus carpio</i>	0	1	1	0.6%
Diamond Turbuot	<i>Hypsopsetta guttulata</i>	10	0	10	5.7%
Leopard Shark	<i>Triakis semifasciata</i>	11	0	11	6.3%
7-Gill Shark	<i>Notorhynchus cepedianus</i>	4	0	4	2.3%
Starry Flounder	<i>Platichthys stellatus</i>	13	15	28	16.1%
Striped Bass	<i>Morone saxatilis</i>	2	6	8	4.6%
Thornback	<i>Platyrhynoides triseriata</i>	1	0	1	0.6%
Total		91	83	174	

In San Pablo Bay, we observed (1) six instances of harbor seals and one instance of California sea lions within 50 meters of the net and (2) no instance of sea lions raiding the net and no instances of seals raiding the net. In Suisun Bay, we observed (1) five instances of harbor seals and 225 instances of California sea lions within 50 meters of the net and (2) one instance of seals raiding the net and 214 instances of at least one sea lion (seemingly 1-3 individuals) raiding the net.

USFWS collected fin clips, blood samples, and/or muscle plugs from 265 White Sturgeon with fork lengths 53-200 cm FL (Figure 4) and fin clips from 12 Green Sturgeon. One of the 29 acoustic tags detected by USFWS was from a Chinook Salmon tagged by CDFW and the rest were from White Sturgeon tagged by UC Davis or USFWS.

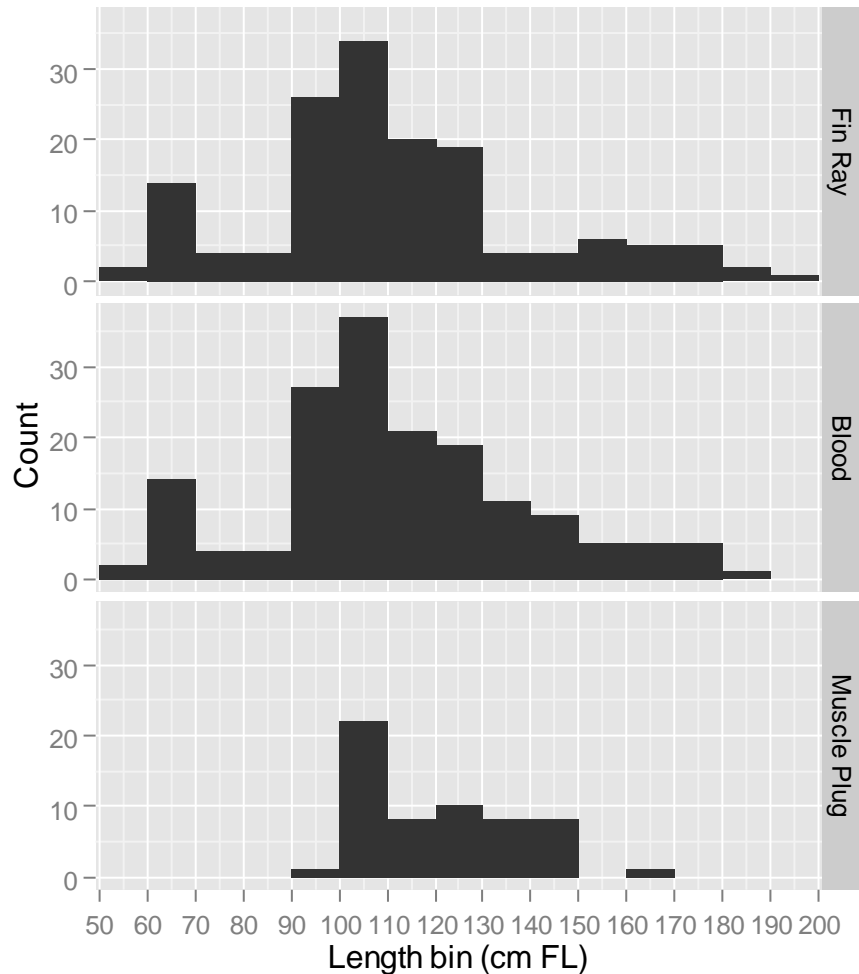


Figure 4. Length frequency distribution of biological samples (Fin Ray, Blood, and Muscle Plug) collected from White Sturgeon during 2015 tagging operations; bins by 10 cm not including right (e.g., 50-59, 60-69) except for final bin — does include 200 cm FL

Acknowledgments

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Affiliation	Name	Position
CDFW	Michelle Avila	Senior Laboratory Assistant
	Jeremiah Bautista	Environmental Scientist
	David Bridgman	Scientific Aide
	Marco Cabral	F & W Technician
	Greg Ferguson	F & W Technician
	Ken Flowers	Mate
	Jen Giannetta	Environmental Scientist
	Michael Grady	F & W Technician
	Kent Hespeler	Mate
	David Hull	Mate
	Ryan Kok	Scientific Aide
	Felipe La Luz	Environmental Scientist
	Spencer Lewis	F & W Technician
	Jared Mauldin	F & W Technician
	Lance Meyer	F & W Technician
	Kaylynn Rammell	Scientific Aide
	Matt Seipert	F & W Technician
	Ramiro Soto	Mate
SFEI	Jen Sun	
USFWS	David Dominguez	Technician
	Garrett Giannetta	Technician
	Laura Heironimus	Technician
	Zac Jackson	Fishery Biologist

Appendix 1 (Tag numbers released in 2015; new this year: \$150 tags)

	From	To
\$50	FF2130	FF2177
Tags	FF2180	FF2195
	From	To
\$100	HH2130	HH2177
Tags	HH2180	HH2194
	From	To
\$150	HF2130	HF2177
Tags	HF2180	HF2194

Appendix 2 Spatial and temporal (monthly) catch of White Sturgeon (WST) per net set per vessel. Two net sets in Suisun Bay and 36 nets sets in San Pablo Bay are not shown for purposes of image scaling.

