

2010 Field Season Summary for the Adult Sturgeon Population Study

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

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Field Season: August 4, 2010 – October 27, 2010

Introduction

An adult sturgeon population study conducted by the California Department of Fish and Game (CDFG) has been ongoing intermittently since 1967. Part of the study is a “high-value reward” tagging program. Presented here is a summary of the 2010 sturgeon-tagging field season.

The tagging program is designed to understand and monitor the population dynamics of white sturgeon (*Acipenser transmontanus*) and green sturgeon (*Acipenser medirostris*), with the ultimate goal being to provide the tools to inform management. 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, and release in good condition as many sturgeon as possible and document previously-tagged sturgeon. We also collaborated with other researchers investigating various aspects of sturgeon biology and behavior.

Methods

Our field season began August 4, 2010 and ended October 27, 2010. We captured sturgeon using trammel nets deployed from the CDFG research vessels *Striper II* (fishing in Suisun Bay) and *New Alosa* (San Pablo Bay and Suisun Bay). We continued the two major alterations to our sampling methodology designed 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 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 2010 season, the *New Alosa* was berthed at the *Vallejo Municipal Marina* and the *Striper II* was berthed at the *Martinez Marina*. Each vessel typically had a standard crew of 4-5 people including a boat operator, a deckhand, two scientific aides, and a Biologist.

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 aides measured and tagged sturgeon, recorded bycatch, collected biological data/samples, and assisted with other 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 the 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). A few fish were too large (approx. > 180 cm) for the cradle, so were processed on the deck.

We checked each fish for old tags (i.e., PIT, disc, etc.) and evidence of a shed or clipped tag, recorded total length to the nearest cm (cm TL), attached a disc-dangler (Petersen) tag¹ to fish 100 – 205 cm TL, took a biological sample, 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 below, courtesy of Harry Morse).

Each tag was labeled with a reward value of \$20, \$50, or \$100.

Each fish in good condition was immediately released. Fish showing an unusually high level of stress and/or trauma (e.g., lack of "gilling", lack of vigor, or severe bleeding) were placed in the plastic holding tub for resuscitation and released w/o a tag as soon as their condition appeared to improve.

Recaptured fish were retagged if the old tag was too tight or loose or had caused sores to form. Captured sturgeon that had obviously been tagged at one time but for which the tag was no longer present (i.e., wire was present below the



¹ See Appendix 1.

dorsal fin) were recorded as having a “shed tag” then re-tagged and released. Sturgeon that did not have a tag or wires present but exhibited open sores or scars at the location of tagging were recorded as having “possibly shed tags”.

University of California at Davis researchers surgically implanted acoustic transmitters in 68 white sturgeon (between 100 and 200 cm TL) and one green sturgeon (66 cm TL) as part of a collaborative effort to document sturgeon habitat use.

Bycatch was identified to species, counted, measured if Chinook salmon or California halibut, and released as quickly as possible. All marine mammals (Pacific harbor seals and California sea lions) within 50 meters and any instance of a marine mammal predation on fish captured in the net were recorded.

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 un-tagged fish. The unit of effort was 100 net-fathom-hours, 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

We set the net 320 times during 64 boat-days² (45 calendar days) for a total of 256 hours of fishing time (~21,000 net-fathom-hours). Average fishing time per set was about 49 minutes. The net was set an average of 5 times per day per boat.

Four hundred two white sturgeon (WST) and 37 green sturgeon (GST) were captured (includes recaptured fish). Of the white sturgeon captured, 282 were then tagged. Of the green sturgeon captured, 18 were then tagged. Four white sturgeon were recaptured and one white sturgeon appeared to have shed a tag (Table 1).

Table 1. White sturgeon recaptured during 2010 sturgeon-tagging field work

Date of Recapture	Tag Number	Recapture Location	Year Tagged	Years at Large	Length at Tagging (cm TL)	Length at Recapture (cm TL)	Growth per Year (cm)
8/11/2010	ST12403	Suisun Bay	2008	2	156	165	4.5
8/18/2010	ST11936 ^a	San Pablo Bay	2005	5	123	148	5.0
8/19/2010	HH1075	San Pablo Bay	2006	4	123	145	5.5
9/15/2010	shed tag ^b	Suisun Bay	N/A	N/A	N/A	141	N/A
9/20/2010	FF1534 ^c	Suisun Bay	2007	3	141	143	0.7

^a Fish found dead (decomposing)

^b No tag present; possibly shed tag - unable to determine year tagged and length at tagging

^c Also PIT tagged (#17013)

² The *New Alosa* did not sample during the month of October.

We made no “true” in-season recaptures, defined for statistical purposes (i.e., assuming random mixing in the population) as a sturgeon recaptured greater than 30 days from initial tagging but within the 2010 tagging season. We recaptured one white sturgeon and one green sturgeon that had been at large less than 30 days.

Average daily CPUE for legal-sized (117 – 168 cm TL) white sturgeon was 0.9 and for all sizes of white sturgeon was 1.9. Average CPUE per drift (net set) for all sizes of white sturgeon was greatest on 04-Oct (5.7 ± 1.6; Figure 1). Average CPUE for all sizes of white sturgeon was nearly the same in September and October (Figure 2). Catch per 100 net-fathom hours of white sturgeon within the current slot limit (117 – 168 cm TL) was 0.9 ± 0.1 and was below the historical average of 2.8 (Figure 3).

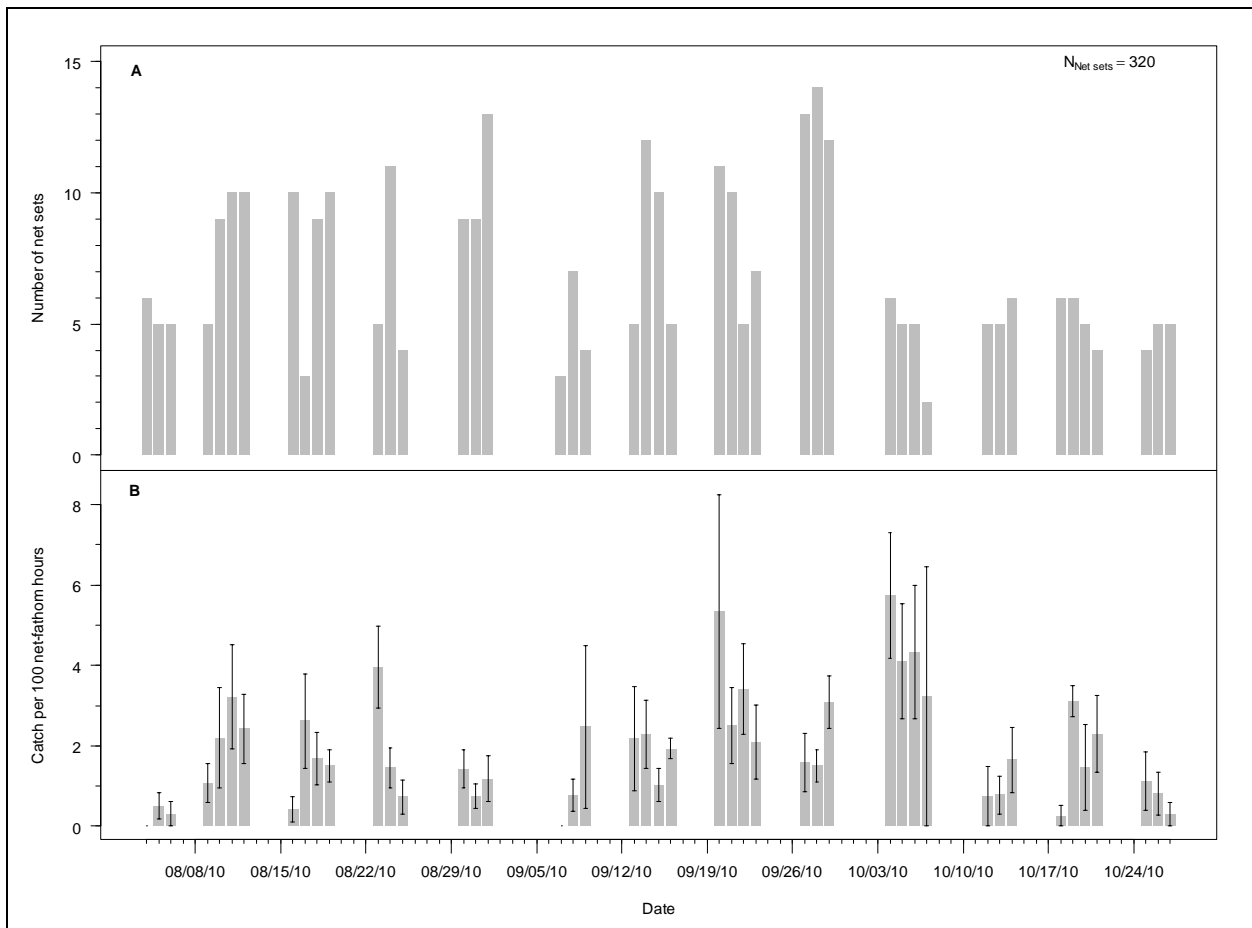


Figure 1. (A) Number of net sets deployed each day, (B) White sturgeon average catch per 100 net-fathom hours ± 1 SE of all net sets that day (average was zero on 04-Aug and 07-Sep)

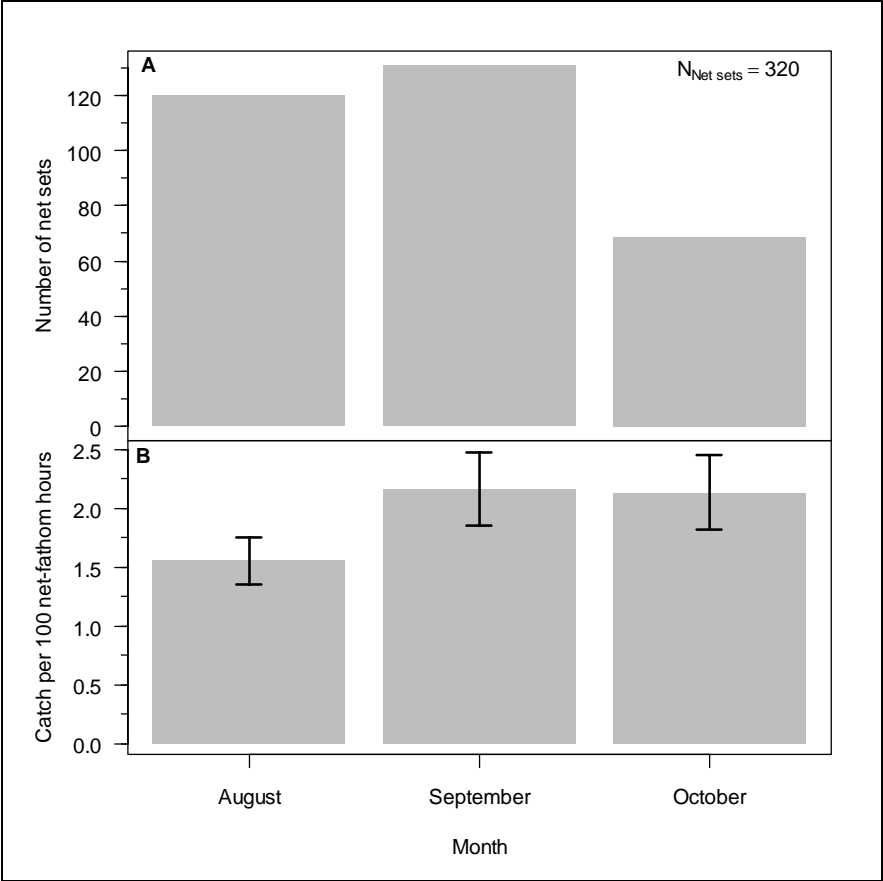


Figure 2. (A) Number of net sets deployed each month in 2010, (B) White sturgeon average catch per 100 net-fathom hours \pm 1 SE of all net sets that month

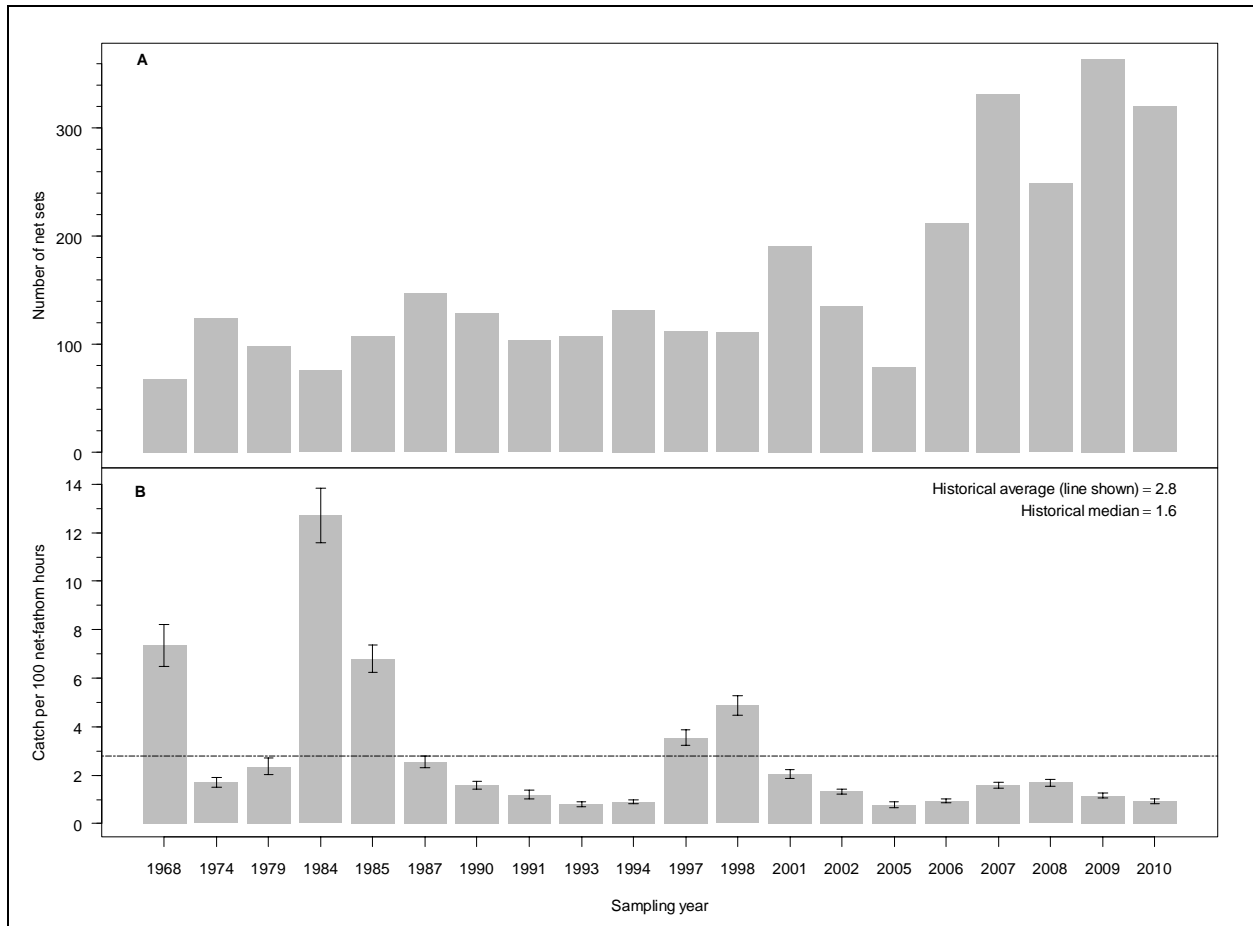


Figure 3. (A) Number of net sets completed annually, (B) Average catch per 100 net-fathom hours (using all net sets) of white sturgeon within current slot limit (117 – 168 cm TL) captured during CDFG sturgeon population study tagging operations

The white sturgeon length frequency distribution was possibly tri-modal, with peaks at 73 – 76, 117 – 120, and 165 – 168 cm TL (Figure 4). The percentage increase of smaller fish (about < 90 cm TL) compared to last season likely indicates the strong 2006 year-class is recruiting to the tagging gear.

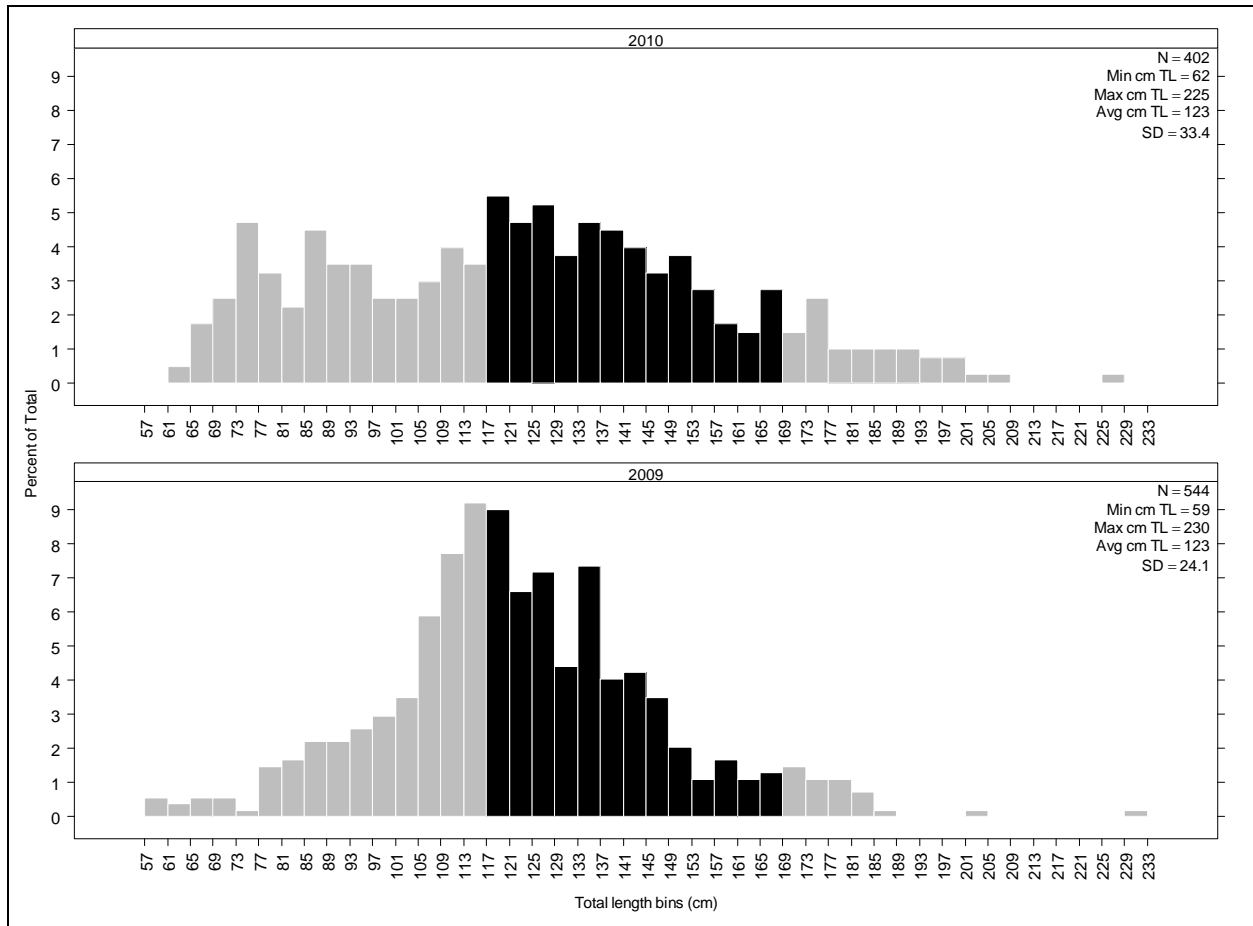


Figure 4. Length frequency distribution (as percent of total catch) of white sturgeon in 2010 (top) and 2009 (bottom); dark bars denote current slot limit (117 – 168 cm TL)

We measured 36 green sturgeon this season (Figure 5). The size range was between 63 and 196 cm TL, and the average was 108 cm TL. Most green sturgeon were captured in San Pablo Bay during August (e.g., 14 on 12-Aug), and only five were captured after 01-Sep.

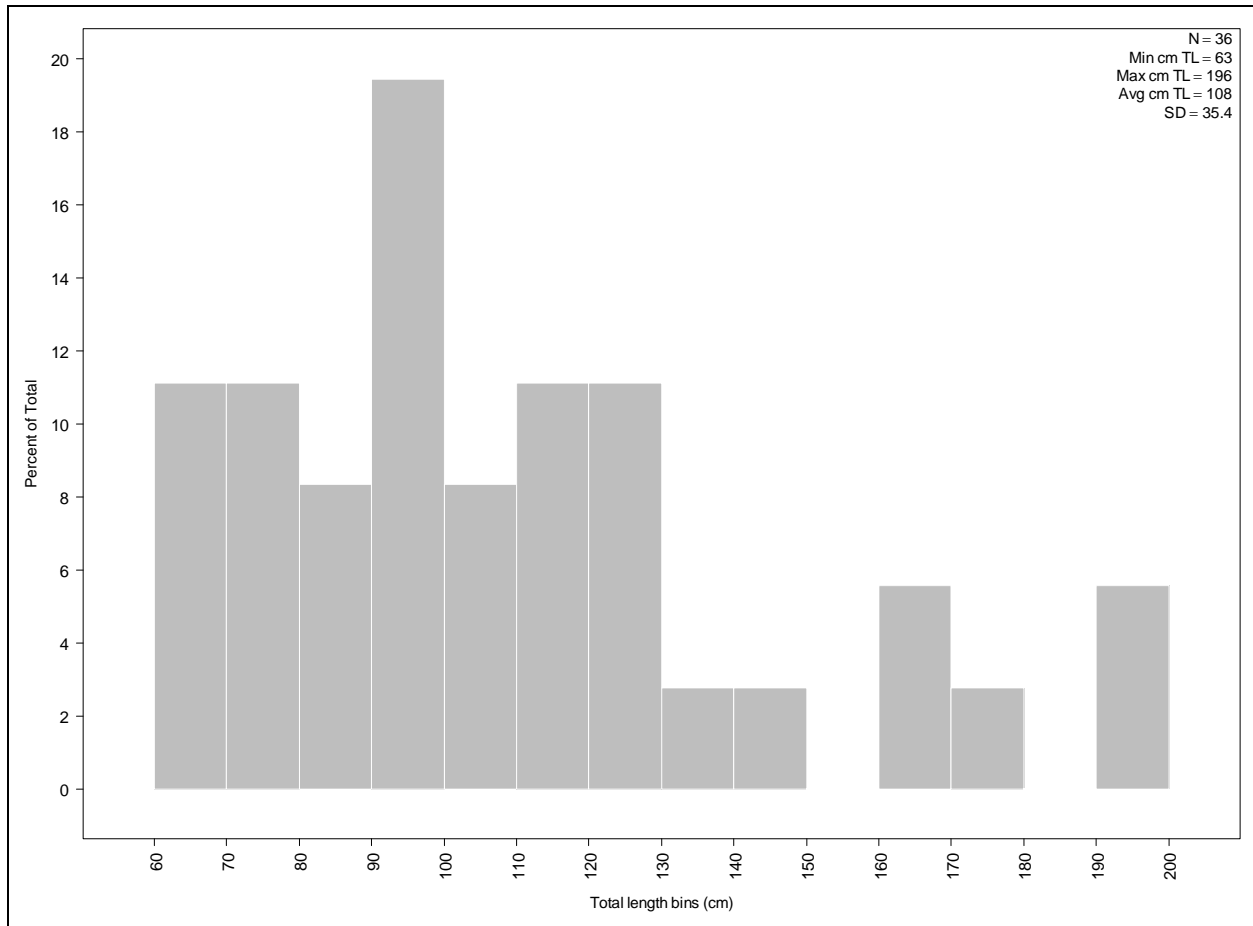


Figure 5. Length frequency distribution (as percent of total catch) of green sturgeon in 2010

No bycatch was retained and most was released alive. Bycatch was more abundant and more diverse in San Pablo Bay (Table 2). Only Chinook salmon were captured significantly more often in Suisun Bay. California halibut (N=10, 9 measured) ranged from 53 – 91 cm fork length (cm FL) and averaged approximately 67 cm FL. Chinook salmon (N=159, 157 measured) ranged from 46 – 119 cm FL and averaged approximately 79 cm FL. Note: Most fork lengths were approximated in order to return these fish to the water quickly.

In San Pablo Bay, we observed nine instances of at least one seal within 50 meters of the net, two instances of at least one sea lion within 50 meters of the net, and four instances of at least one seal raiding the net. In Suisun Bay, we observed 13 instances of at least one seal within 50 meters of the nets, 16 instances of at least one sea lion within 50 meters of the net, two instances of at least one seal raiding the net, and four instances of at least one sea lion raiding the net.

Table 2. Numbers of other species caught (bycatch) during the 2010 sturgeon tagging season

Bycatch Species	Scientific Name	San Pablo Bay	Suisun Bay	Total	Percent of Total
Bat Ray	<i>Myliobatis californica</i>	339		339	53.0%
Brown Smoothhound	<i>Mustelus henlei</i>	4		4	0.6%
California Halibut	<i>Paralichthys californicus</i>	10		10	1.6%
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	20	139	159	24.8%
Diamond Turbot	<i>Hypsopsetta guttulata</i>	8		8	1.3%
Leopard Shark	<i>Triakis semifasciata</i>	50		50	7.8%
Pipefish	<i>Syngnathus leptorhynchus</i>	1		1	0.2%
7-Gill Shark	<i>Notorhynchus cepedianus</i>	24		24	3.8%
Starry Flounder	<i>Platichthys stellatus</i>	21	13	34	5.3%
Striped Bass	<i>Morone saxatilis</i>	4	5	9	1.4%
Thornback	<i>Platyrhynoides triseriata</i>	2		2	0.3%
Total		483	157	640	

One Dungeness crab caught in San Pablo Bay

Acknowledgments

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Appendix 1 (Tag numbers released in 2010)

	From	To
\$20 Tags	ST12830	ST12860
	ST12863	ST12874
	ST12877	ST12895
	ST12897	ST12905
	ST12907	ST12933
	From	To
\$50 Tags	FF1829	FF1836
	FF1838	FF1860
	FF1863	FF1874
	FF1876	FF1932
	From	To
\$100 Tags	HH1829	HH1860
	HH1862	HH1874
	HH1876	HH1932