

2011 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: 01 August 2011 – 25 October 2011
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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 2011 sturgeon-tagging field season. For summaries from previous seasons, please click [Bibliography](#).

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 01 August 2011 and ended 25 October 2011. We captured sturgeon using trammel nets deployed from the CDFG 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 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 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 2011 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, one to two scientific aides, other researchers, and a biologist.

Both vessels were equipped with one 100-fathom (~183 m) trammel net, one hydraulic net reel, one resuscitation tub, and two tagging stations. 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 – 217 cm TL, 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.

Captured sturgeon that did not have a tag and did not show an obvious sign of having been tagged (i.e., wires present) but exhibited open sores or scars at the location of tagging were recorded as having "possibly shed tags". These fish were then fitted with a disc tag.



¹ See Appendix 1.

University of California at Davis researchers surgically implanted acoustic transmitters in 80 white sturgeon (between ~ 60 and ~ 180 cm TL) and in 10 green sturgeon (between ~ 60 and ~ 180 cm TL) as part of a collaborative effort to document sturgeon habitat use. Using a hydrophone during several of the drifts this season, UC Davis researchers detected three acoustic transmitters from last season's (2010) sturgeon tagging. These tags were implanted in white sturgeon² caught in Suisun Bay, and two of these tags (62791 and 47829) were detected by receivers in the Sacramento River.

Bycatch was identified to species, counted, measured if Chinook salmon, California halibut, or leopard shark (sexed also) 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 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

We set the net 400 times during 80 boat-days (48 calendar days) for a total of 320 hours of fishing time (~26,800 net-fathom-hours). Average fishing time per set was about 48 ± 8.1 (SD) minutes. The net was set an average of 5 times per day per boat.

Seven hundred nine (709) white sturgeon (WST) and 16 green sturgeon (GST) were captured (includes recaptured fish). Of the white sturgeon captured, 428 were then tagged. Of the green sturgeon captured, 10 were then tagged.

Five white sturgeon were recaptured, including one true in-season³ recapture and one PIT tagged (from 2007) which appeared to have shed the disc tag (Table 1). We recaptured one white sturgeon within the same day and had two cases where a disc tag was found in the net. In both cases the tag was from this season, and the fish had been at large ≤ 2 days. Neither fish was included in the total number tagged (N=428). We did not recapture any green sturgeon this season.

² each sturgeon was fitted with a disc tag and acoustic tag (disc: FF1909, acoustic: 62719; HH1916, 47829; ST12928, 47854)

³ 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 2011 tagging season

Table 1. White sturgeon recaptured during 2011 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)
6-Sep-11	FF1851	San Pablo Bay	2010	1	114	125	11.0
20-Sep-11	FF2010	San Pablo Bay	2011	see note a	129	130	NA
28-Sep-11	see note b	Suisun Bay	2007	4	125	149	6.0
4-Oct-11	FF1610	Suisun Bay	2008	3	183	192	3.0
4-Oct-11	HH1714	Suisun Bay	2009	2	146	165	9.5

^a True in-season recapture; fish tagged 09-Aug-2011 in San Pablo Bay

^b Fish tagged with disc tag HH1584 and PIT tag 17483 23-Oct-2007; when recaptured PIT detected but no disc tag present; angler tag return records do not show disc tag as being returned - possibly shed tag

Average daily CPUE for legal-sized (117 – 168 cm TL) white sturgeon was 1.0 and for all sizes of white sturgeon was 2.6. Average daily CPUE per drift (net set) for all sizes of white sturgeon was greatest on 11-Oct (5.7 ± 1.0 (SE); Figure 1). Average CPUE for all sizes of white sturgeon was nearly the same each month (Table 2). Catch per 100 net-fathom hour of white sturgeon within the current slot limit (117 – 168 cm TL) was 1.0 ± 0.1 (SE) and was below the historical average of 2.8 (Figure 3).

Table 2. Average catch per 100 net-fathom hour per month for white sturgeon

Month	Average CPUE	SE	Number of net sets
August	2.63	0.27	140
September	2.58	0.26	149
October	2.45	0.24	111

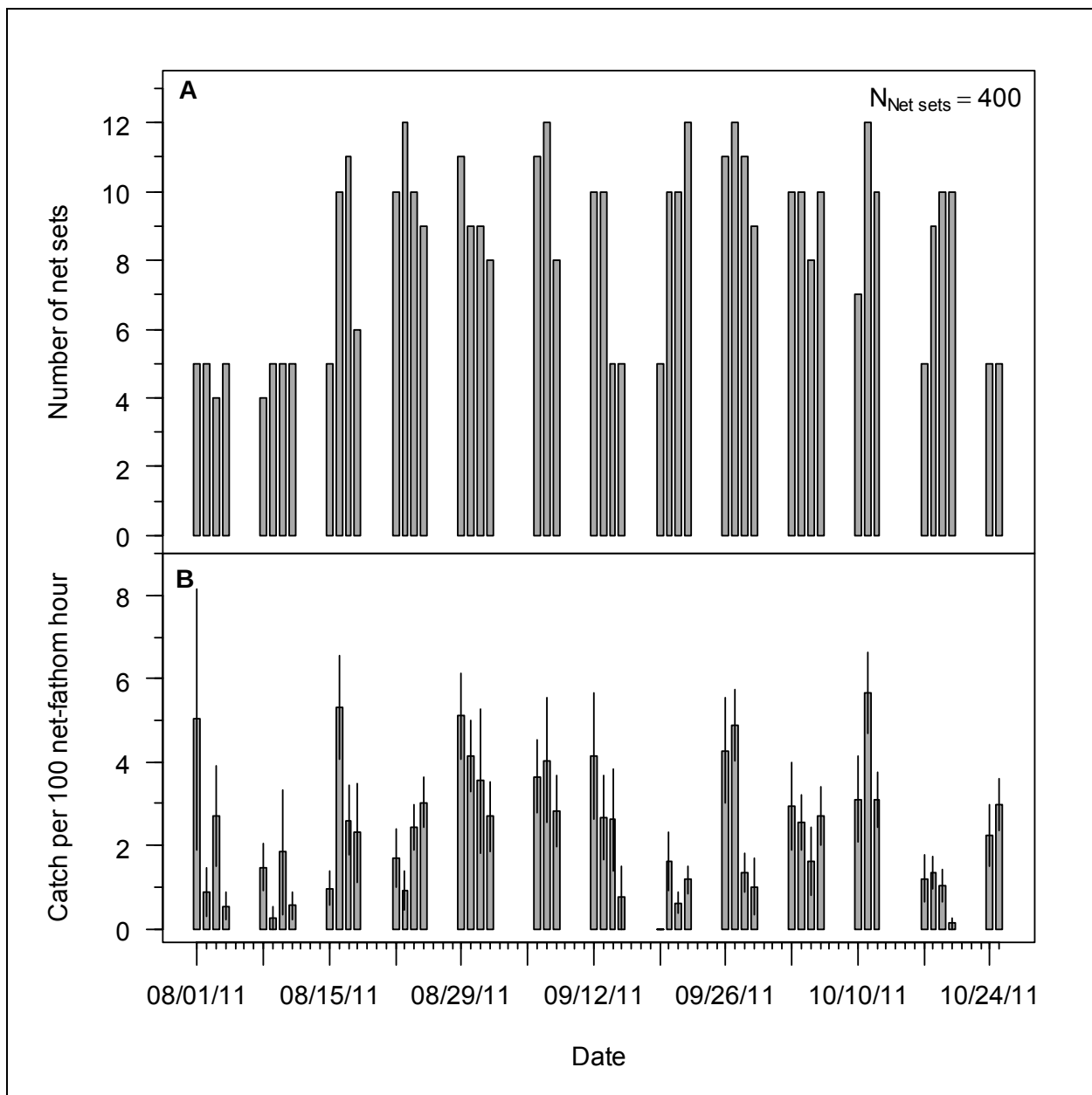


Figure 1. (A) Number of net sets each day, (B) White sturgeon average catch per 100 net-fathom hour $\pm$ 1 SE of all net sets that day (average was zero on 19-Sep)

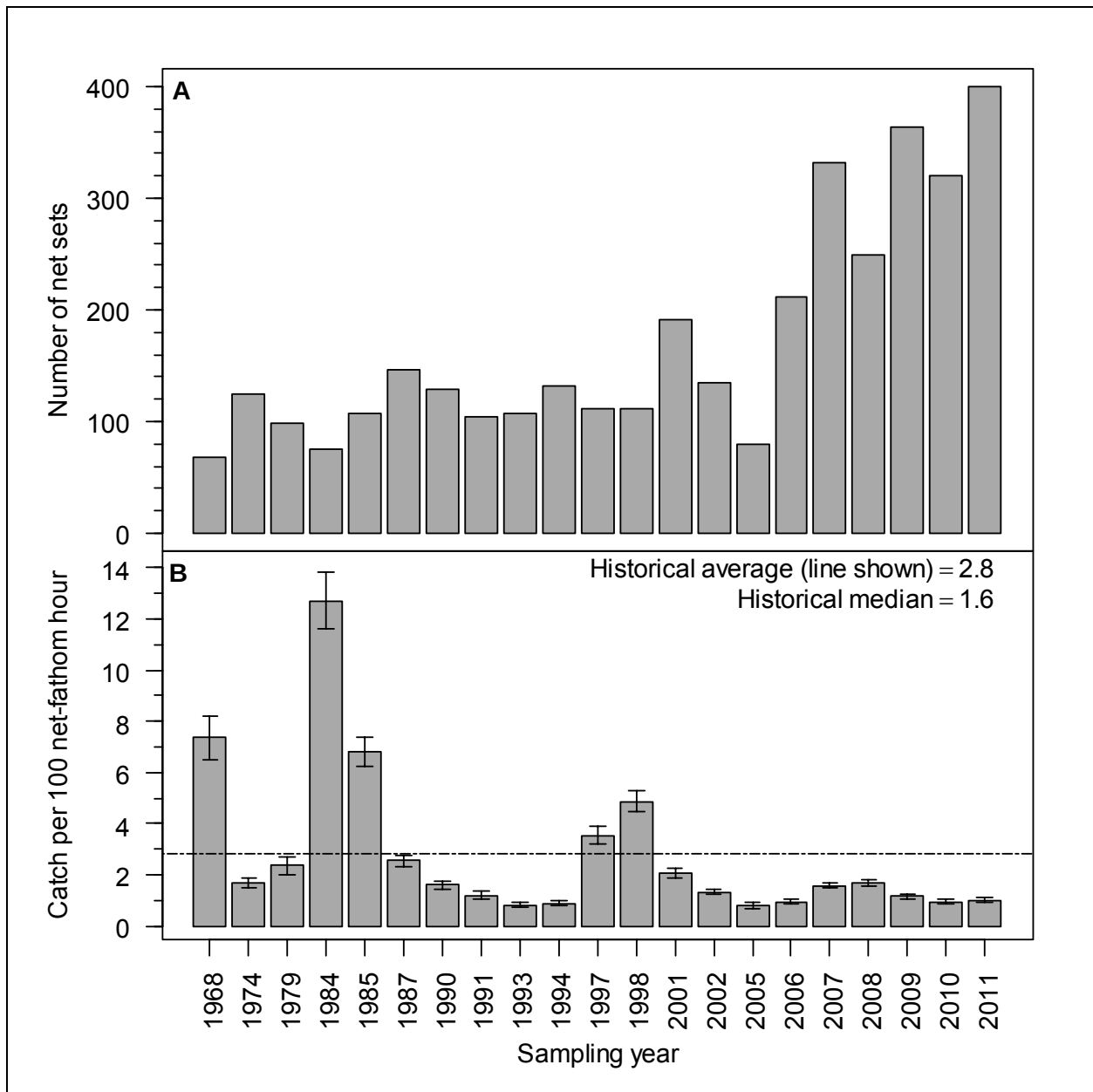


Figure 2. (A) Number of net sets completed annually, (B) Average catch per 100 net-fathom hour $\pm$ 1 SE (using all net sets) of white sturgeon within current slot limit (117 – 168 cm TL) captured during CDFG sturgeon population study tagging operations

The white sturgeon length frequency distribution (for 2011) was possibly bi-modal, with the strongest peak at 80 – 89 cm TL (nearly 20% of total catch; Figure 4). The percentage increase of smaller fish (about < 100 cm TL) compared to last season likely indicates the strong 2006 year-class continues to recruit to the tagging gear.

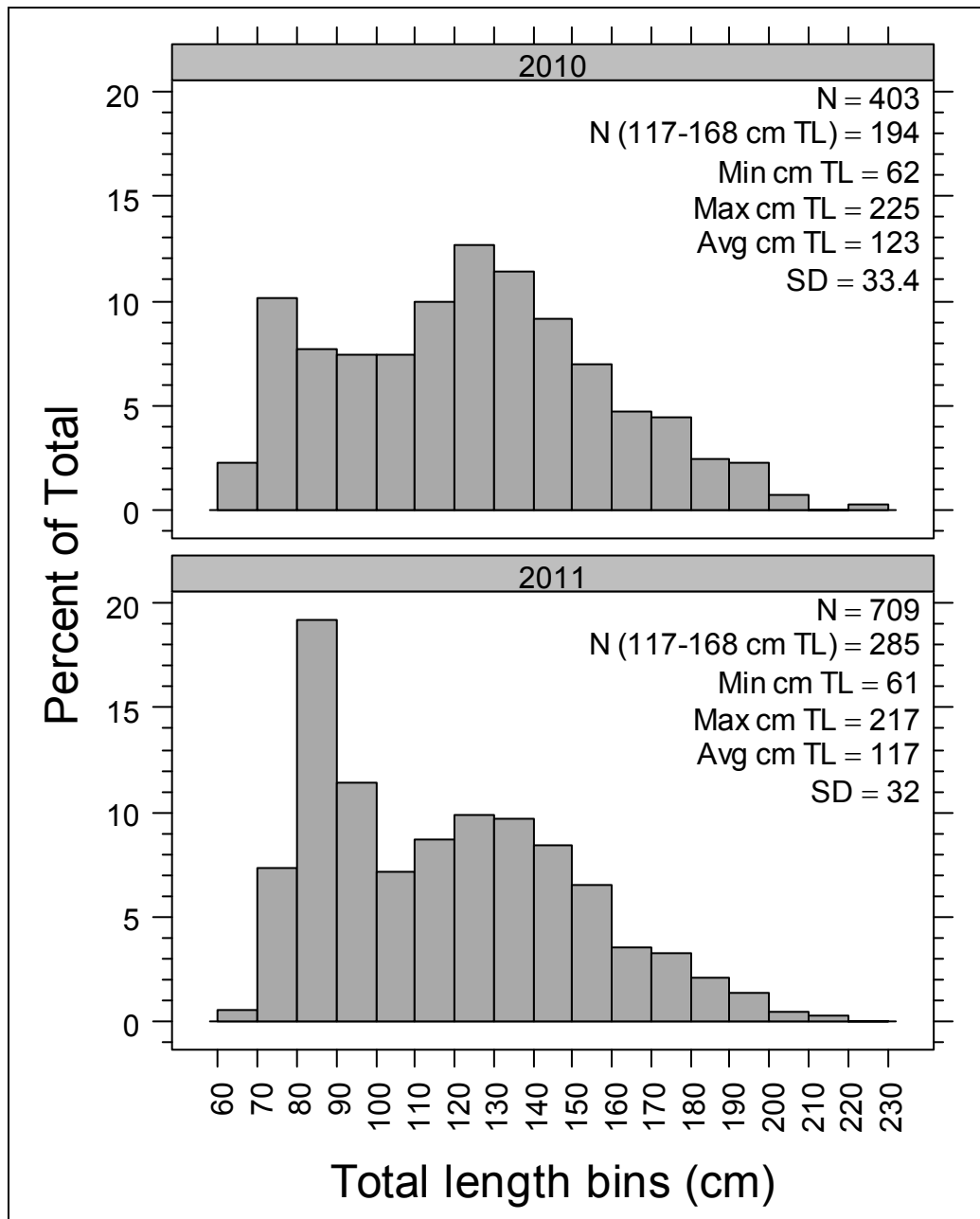


Figure 3. Length frequency distribution (as percent of total catch) of white sturgeon in 2010 (top) and 2011 (bottom); number within the current legal harvestable size (117 -168 cm TL) included for reference

We measured 16 green sturgeon this season (Figure 5). The size range was between 57 and 178 cm TL, and the average was 108 ± 37 (SD) cm TL. Most green sturgeon were captured during August (N=9, San Pablo Bay; N=5, Suisun Bay), and only two were captured after 01-Sep (both in Suisun Bay).

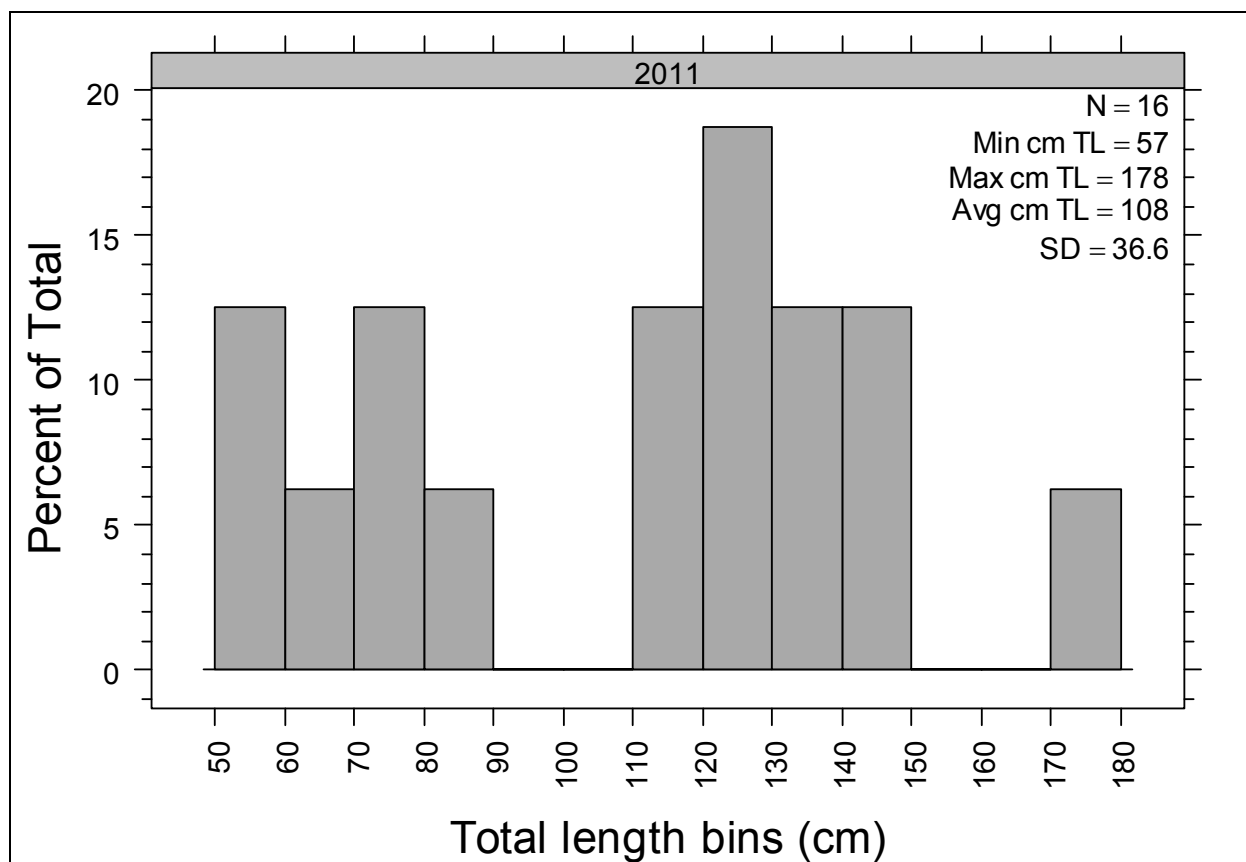


Figure 4. Length frequency distribution (as percent of total catch) of green sturgeon in 2011

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, starry flounder, and striped bass were captured significantly more often in Suisun Bay. California halibut (N=5) ranged from 48 – 90 cm fork length (cm FL) and averaged 67 ± 18 (SD) cm FL. Chinook salmon (N=164, 162 measured) ranged from about 50 – 110 cm FL and averaged approximately 80 ± 12 (SD) cm FL. (Note: Most salmon lengths were approximated in order to return these fish to the water quickly.) Female leopard sharks (N=14) ranged from 98 – 134 cm TL and averaged 114 ± 12 (SD) cm TL. Male leopard sharks (N=17) ranged from 104 – 134 cm TL and averaged 116 ± 8 (SD) cm TL.

In San Pablo Bay, we observed nine instances of at least one seal within 50 meters of the net, 14 instances of at least one sea lion within 50 meters of the net, and four instances of at least one sea lion raiding the net. In Suisun Bay, we observed seven instances of at least one seal within 50 meters of the nets, 191 instances of at least one sea lion within 50 meters of the net and 93 instances of at least one sea lion raiding the net.

On 20-Sept in San Pablo Bay, we discovered a sea lion in our net upon retrieval. The sea lion was dead, and the carcass was turned over — the same day — to the Marine Mammal Center in Sausalito, CA. The sea lion was not observed swimming near the net or the boat during fishing operations.

Table 3. Numbers of other species caught (bycatch) during the 2011 sturgeon tagging season

Bycatch Species	Scientific Name	San Pablo Bay	Suisun Bay	Total	Percent of Total
Bat Ray	<i>Myliobatis californica</i>	210		210	42.3%
Brown Smoothhound	<i>Mustelus henlei</i>	3		3	0.6%
California Halibut	<i>Paralichthys californicus</i>	5		5	1.0%
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	24	140	164	33.0%
Diamond Turbot	<i>Hypsopsetta guttulata</i>	6		6	1.2%
Leopard Shark	<i>Triakis semifasciata</i>	31		31	6.2%
7-Gill Shark	<i>Notorhynchus cepedianus</i>	6		6	1.2%
Starry Flounder	<i>Platichthys stellatus</i>	21	32	53	10.7%
Striped Bass	<i>Morone saxatilis</i>	1	13	14	2.8%
Thornback	<i>Platyrrhynoides triseriata</i>	2		2	0.4%
White Croaker	<i>Genyonemus lineatus</i>	3		3	0.6%
Total		312	185	497	

Acknowledgments

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Appendix 1 (Tag numbers released in 2011)

	From	To
	ST13000	ST13094
\$20	ST13126	ST13159
Tags	ST13161	ST13171
	ST13173	ST13178
	From	To
	FF2000	FF2036
\$50	FF2038	FF2064
Tags	FF2066	FF2093
	FF2126	FF2157
	FF2159	FF2178
	From	To
\$100	HH2000	HH2093
Tags	HH2126	HH2178