

# **2009 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 10, 2009 – October 27, 2009

## 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 2009 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 science-based resource management decisions. 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.

## Methods

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). Our field season began August 10, 2009 and ended October 27, 2009. 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 2009 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 either immediately removed from the net and 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 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) tag<sup>1</sup> to fish 100 – 201 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, photo courtesy Harry Morse 2008). Each tag was labeled with a reward value of \$20, \$50, or \$100.

A few fish were too large (approx. > 180 cm) for the cradle, so were processed on the deck. 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



<sup>1</sup> See Appendix 1.

tagged at one time but for which the tag was no longer present (i.e. wire was present below the 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”.

Biological samples were collected on certain fish for collaborators. Fin samples (< 1 cm<sup>2</sup>) were taken from the dorsal or pectoral fin on most sturgeon irrespective of size. All samples were stored in ethanol for later analysis. Acoustic transmitters were surgically implanted in eight white sturgeon (between 130 and 154 cm TL) this season as part of a collaborative effort with UC Davis researchers to track sturgeon migration. Transmitters were implanted in sturgeon collected in Suisun Bay from October 12 to October 26.

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.

## Results

We set the net 364 times during 69 boat-days<sup>2</sup> (40 calendar days) for a total of 311 hours of fishing time (~25,511 net-fathom-hours). Average fishing time per set was 52 minutes and on average the net was set 5.3 times per day.

Five hundred forty-four white sturgeon (WST) and 103 green sturgeon (GST) were captured (includes recaptured fish). Of the white sturgeon captured, 457 were then tagged. Of the green sturgeon captured, 60 were then tagged. Five white sturgeon were recaptured, one of which appeared to have shed a tag (Table 1).

Table 1. White sturgeon recaptured during 2009 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)
08/25/09	ST12404	Suisun Bay	2008	1	127	133	6.0
08/27/09	ST12261 <sup>a</sup>	Suisun Bay	2007	2	112	121	4.5
08/31/09	shed tag <sup>b</sup>	San Pablo Bay	N/A	N/A	N/A	165	N/A
10/05/09	HH1170	Suisun Bay	2006	3	127	133	2.0
10/08/09	HH807	Suisun Bay	2002	7	149	157	1.1

<sup>a</sup> Also PIT tagged (#20003); <sup>b</sup> No tag present - unable to determine year tagged and length at tagging

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 the initial tagging date but within the 2009 tagging season. We recaptured three white sturgeon and one green sturgeon that had been at large less than 30 days.

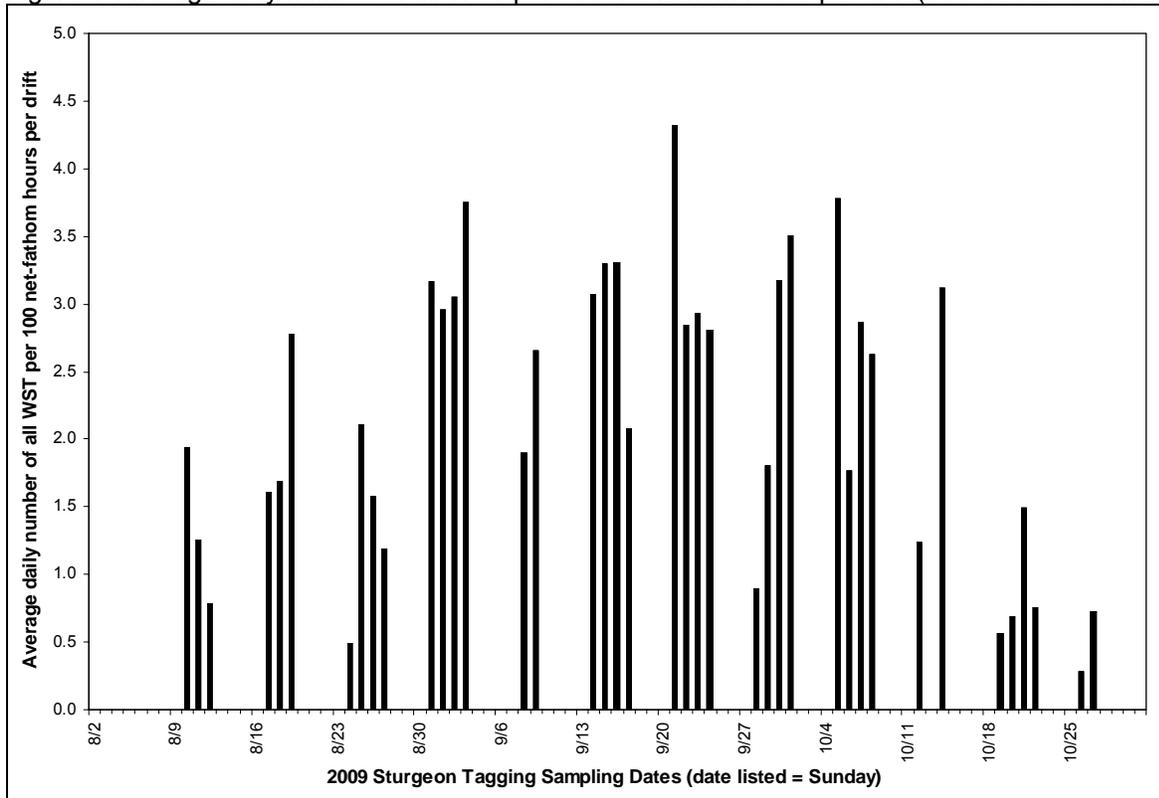
Catch per unit effort (CPUE) was calculated to estimate daily and monthly relative abundance and to compare annual estimates of relative abundance for white sturgeon. Catch was calculated as the sum of all newly-tagged fish, recaptured fish, and un-

<sup>2</sup> The *New Alosa* did not sample the weeks of September 20 and October 25.

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%.

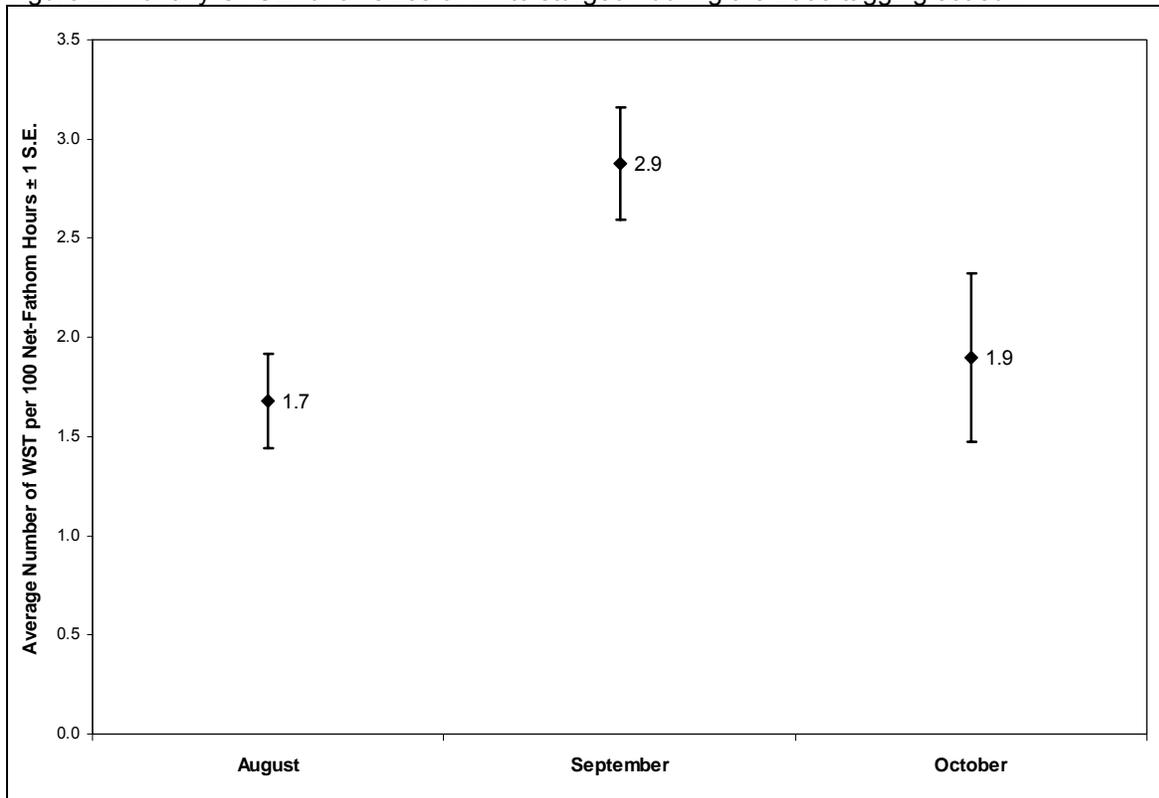
Average daily CPUE for legal-sized (117 – 168 cm TL) white sturgeon was 1.2 and for all sizes of white sturgeon was 2.2. Average daily CPUE per drift (net set) for all sizes of white sturgeon was greatest on September 21 (CPUE = 4.3; Figure 1). Exceptional average daily CPUE appeared to have occurred randomly throughout the three months of sampling and did not appear to correlate well with CPUE on adjacent days. The CPUE time series (Figure 1) did not appear to show any strong temporal autocorrelation, though some periodicity might have been present due to tidal influences.

Figure 1. Average daily number of all WST per 100 net-fathom hours per drift (both boats combined)



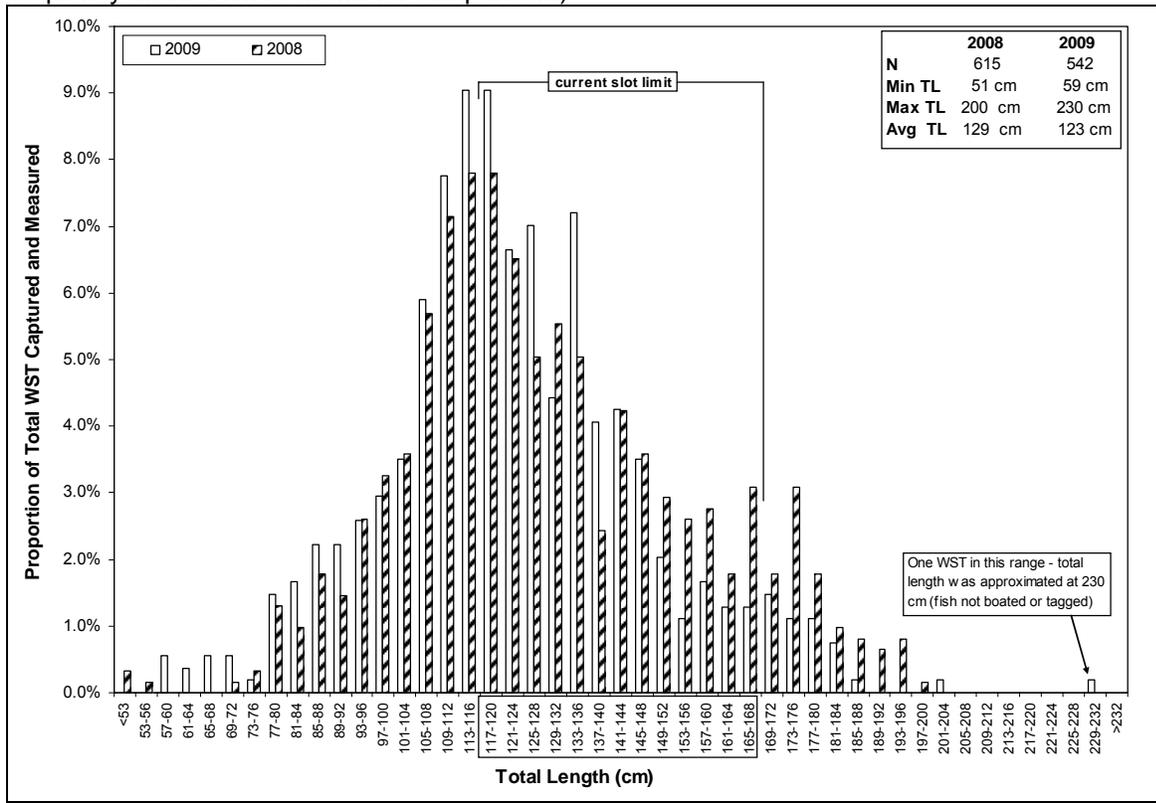
Average daily CPUE for all sizes of white sturgeon was slightly higher in September than August and October (Figure 2). August and October had similar average daily CPUE values, although October had more variability.

Figure 2. Monthly CPUE for all sizes of white sturgeon during the 2008 tagging season



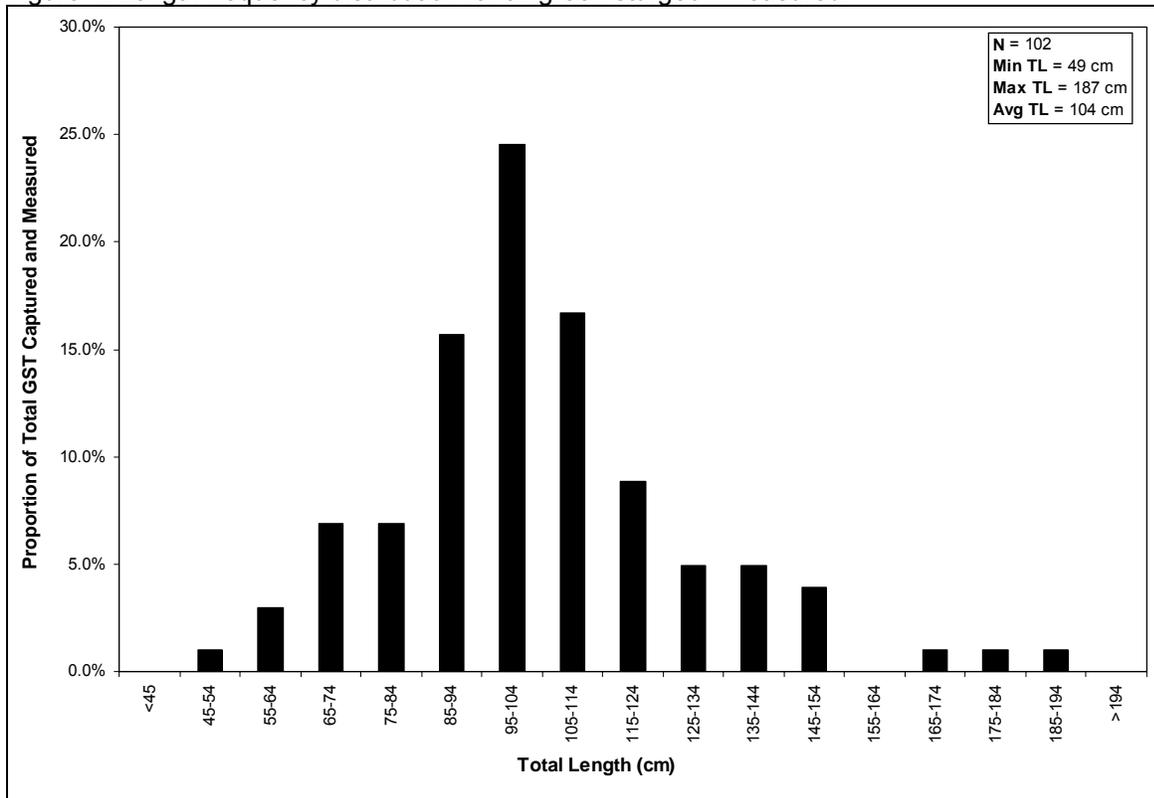
White sturgeon length frequency distribution was slightly bi-modal, with the major peaks at 113 – 116 cm TL and 117 – 120 cm TL (Figure 3). About 17% of the fish this season were between 109 and 116 cm TL, indicating that a large cohort is nearing entry into the recreational fishery. Compared to last season, we caught fewer bigger-sized white sturgeon ( $\geq 149$  cm TL).

Figure 3. Length frequency distribution for all white sturgeon measured. The 2008 tagging season length frequency distribution is shown for comparison.)



We caught and measured 102 green sturgeon this season (Figure 4). About 25% were between 95 and 104 cm TL. The majority of green sturgeon were between 85 and 114 cm TL.

Figure 4. Length frequency distribution for all green sturgeon measured.



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 more often in Suisun Bay. Bycatch was higher this season than the 2007 season (N=578 in 2007), the last time fishing operations were conducted in both bays.

California halibut (N=56) ranged from 46 – 76 cm fork length (cm FL) and averaged approximately 62 cm FL. Chinook salmon (N=44) ranged from 50 – 98 cm FL and averaged approximately 77 cm FL. Note: Most fork lengths were approximated in order to return these fish to the water quickly and safely.

In San Pablo Bay, we observed 43 instances of at least one seal within 50 meters of the net and two instances of at least one sea lion within 50 meters of the net. We recorded 12 instances of at least one seal raiding the net and one instance of at least one sea lion raiding the net.

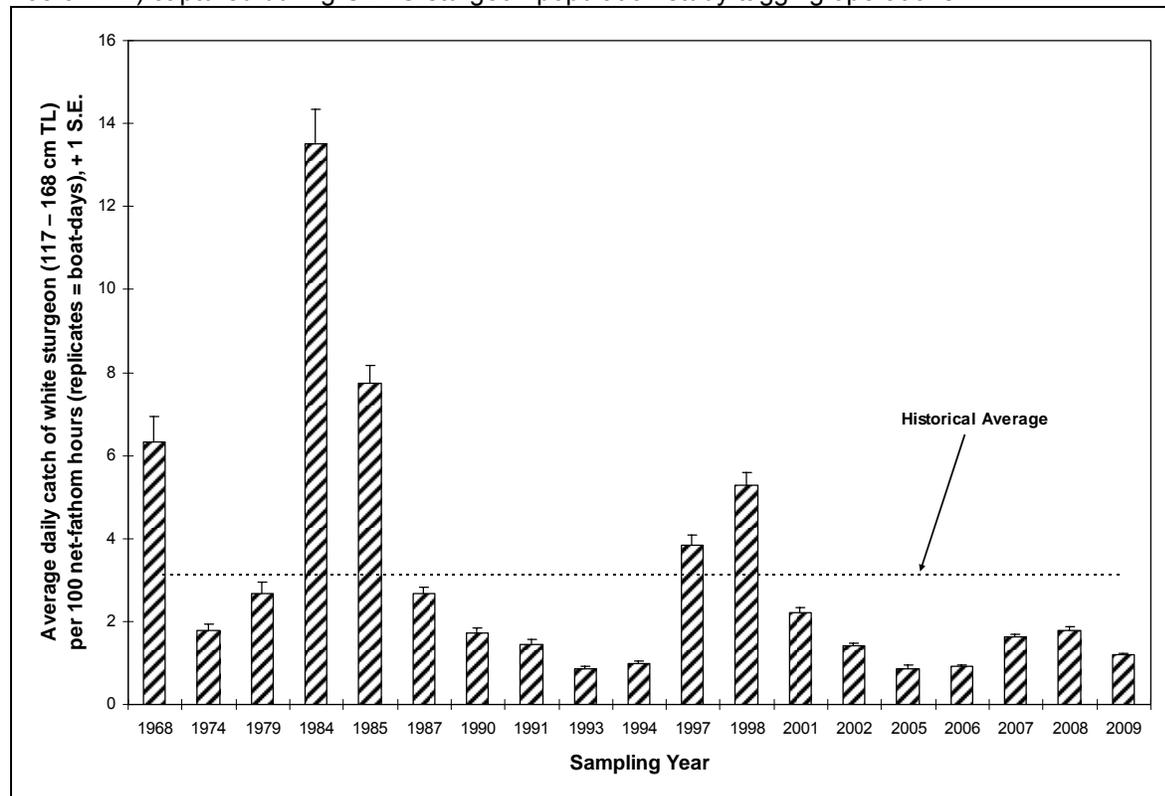
In Suisun Bay, we observed 14 instances of at least one seal within 50 meters of the nets and nine instances of at least one sea lion within 50 meters of the net. We recorded one instance of at least one seal raiding the net and one instance of at least one sea lion raiding the net.

Table 2. Numbers of other species caught (bycatch) during the 2009 sturgeon tagging season

Bycatch Species	Scientific Name	San Pablo Bay	Suisun Bay	Total	Percent of Total
Bat Ray	<i>Myliobatis californica</i>	617		617	59.7%
Brown Smoothhound	<i>Mustelus henlei</i>	28		28	2.7%
California Halibut	<i>Paralichthys californicus</i>	56		56	5.4%
Carp	<i>Cyprinus carpio</i>		1	1	0.1%
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	1	43	44	4.3%
Diamond Turbot	<i>Hypsopsetta guttulata</i>	3		3	0.3%
Leopard Shark	<i>Triakis semifasciata</i>	93		93	9.0%
Monkey Face Eel	<i>Cebidichthys violaceus</i>	1		1	0.1%
Pipefish	<i>Syngnathus leptorhynchus</i>	3	2	5	0.5%
7-Gill Shark	<i>Notorhynchus cepedianus</i>	88		88	8.5%
Skate, un-identified	-	1		1	0.1%
Spiny Dogfish	<i>Squalus acanthias</i>	2		2	0.2%
Starry Flounder	<i>Platichthys stellatus</i>	51	26	77	7.4%
Striped Bass	<i>Morone saxatilis</i>	6	10	16	1.5%
White Croaker	<i>Genyonemus lineatus</i>	2		2	0.2%
<b>Total</b>		<b>952</b>	<b>82</b>	<b>1,034</b>	

Catch per 100 net-fathom hours of white sturgeon within the current slot limit (117 – 168 cm TL) was 1.2 and was below the historical average of 3.1 (Figure 5). Also, catch per 100 net-fathom hours was (1) lower this season than the previous two seasons and (2) lower than the historical median value (value=1.77, year=2008).

Figure 5. Average daily catch per 100 net-fathom hours of white sturgeon within current slot limit (117 – 168 cm TL) captured during CDFG sturgeon population study tagging operations



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## **Appendix 1 (Tag numbers released in 2009)**

\$20 Tags    ST12277 – ST12299  
                  ST12478 – ST12499  
                  ST12593 – ST12599  
                  ST12700 – ST12813  
                  ST12821 – ST12829

\$50 Tags    FF1277 – FF1283  
                  FF1285 – FF1299  
                  FF1477 – FF1494  
                  FF1496 – FF1499  
                  FF1593 – FF1599  
                  FF1700 – FF1812  
                  FF1821 – FF1828

\$100 Tags    HH1276 – HH1299  
                  HH1477 – HH1499  
                  HH1593 – HH1599  
                  HH1700 – HH1812  
                  HH1821 – HH1828