

2012 Sturgeon Fishing Report Card: Preliminary Data Report

Jason DuBois

California Department of Fish and Wildlife
Bay Delta Region (East)
2109 Arch-Airport Road, Suite 100
Stockton, CA 95206

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Summary

The 2012 Sturgeon Fishing Report Card (Card) was issued to anglers at no charge through the Automated License Data System (ALDS). Approximately 113,000 Cards were issued in 2012. As of 10-July-2013, 12,082 Cards were submitted to the Department (1,845 via the Internet and 10,237 via mail) and 2,000 of those Cards had data on sturgeon catch.

Anglers reported the release of 175 green sturgeon, retention of 1,701 white sturgeon, and release of 4,171 white sturgeon. Anglers reported total length measurements for 45 green sturgeon (range 12-90 inches, average 36 inches). Of the white sturgeon retained, anglers reported total length measurements for 1,697¹ (range 46-66 inches, average 56 inches). Of the white sturgeon released, anglers reported a total length measurement for 990 fish (range 10-96 inches, average 43 inches).

Catch of green sturgeon was greatest in Suisun Bay and in the Sacramento River from Rio Vista to Chipps Island. Catch of white sturgeon was greatest in Suisun Bay and in the Sacramento River from Rio Vista to Chipps Island.

Introduction

This report summarizes data from the 2012 California Sturgeon Fishing Report Card (Card). The Card is part of a suite of sport fishing regulations that are intended to protect California's year-round white sturgeon fishery while increasing protections for the federally-threatened green sturgeon population and adding resiliency to the conservation-dependent white sturgeon population.

The 2012 Card was distributed to any angler at no charge exclusively through the Automated License Data System (ALDS) and was required of every angler — including minors, anglers fishing only from piers, and anglers fishing on 'free fishing' days — to fish for or retain a sturgeon in California.

Cards included fields for contact information, retained fish, and released fish (Appendix 1). To aid the Department's efforts to reduce illegal commercialization of sturgeon and to enforce the daily and annual bag limits on white sturgeon, the Cards also included detachable single-use serially-numbered Card-specific tags to be placed on fish retained by anglers.

Information on catch of sturgeon from 2012 Cards is complementary to on-going research conducted by the Department (including application of disk-tags to wild fish) and others and will be used in planned articles and technical reports.

Card Distribution and Return

Approximately 113,000 Cards were issued to anglers. Anglers began returning Cards (on-line or via mail) almost immediately after distribution. Cards returned after preparation of this report began were not described here (cutoff date 10-July-2013). Twelve thousand eighty-two (12,082) Cards were returned of which 4,872 had no data (effort but no catch), 5,210 indicated no fishing effort, and 2,000 had data on sturgeon catch.

Angler Data

The Card included fields for general, personal, and contact information (Appendix 1), but those data are not summarized here. Contact information included name, street address, and city.

¹ See note 1 in 'Length Data' section

Catch Data

The Card contained three sections for reporting sturgeon catch: (1) Sturgeon Retained, (2) Sturgeon Released (no reward disk present), and (3) Sturgeon Released (reward disk present). These sections included fields to report month, day, location, and reward disk number. The 'Sturgeon Retained' section also contained a field for reporting length and reminded anglers that only white sturgeon 44–66 inches total length may be retained. The 'Sturgeon Released (no reward disk present)' section also contained check boxes for species identification that some anglers also used to report fish length.

Recaptures — Thirty-seven (37) anglers each caught one disk-tagged white sturgeon and one angler caught two disk-tagged white sturgeon (Table 1). No tagged disk-green sturgeon were reported.

Table 1. Angler-reported tag recaptures from 2012 Card with corresponding CDFW tagging data; table sorted by date tagged

Date (2012)	Angler-reported Tag Recaptures				CDFW Tagging Data			Days at large	
	Location	Species	Retained	Total Length (inches)	Tag Number	Date Tagged	Species		Total Length (inches)
31-Jan	Sacramento River: Knights Landing to Rio Vista	White	Yes	65	HH0462	24-Aug-01	White	50	3,812
6-May	Suisun Bay	White	Yes	66	FF0788	19-Sep-02	White	58	3,517
4-Feb	Sacramento River: Knights Landing to Rio Vista	White	Yes	61	FF1113	21-Sep-06	White	46	1,962
24-Jan	Sacramento River: Knights Landing to Rio Vista	White	Yes	52	ST12301	17-Oct-06	White	49	1,925
12-Dec	Sacramento River: Rio Vista to Chipps Island	White	Yes	63	HH1533	13-Sep-07	White	61	1,917
8-Apr	Montezuma Slough	Unknown	No	45	HH1548	24-Sep-07	White	41	1,658
4-Feb	Grizzly Bay	White	Yes	55	HH1626	26-Aug-08	White	47	1,257
14-Dec	Sacramento River: Hwy 32 bridge to Colusa	White	Yes	53	1649	2-Sep-08	White	a	1,564
25-Jan	Sacramento Deepwater Ship Channel	White	Yes	65	ST12659	3-Sep-08	White	54	1,239
29-Jan	Sacramento River: Knights Landing to Rio Vista	Unknown	No		FF1673	12-Sep-08	White	67	1,234
5-Jan	Sacramento River: Rio Vista to Chipps Island	Unknown	No	42	FF1424	3-Oct-08	White	43	1,189
19-Apr	San Joaquin River: Stockton to Sherman Lake	White	Yes	62	HH1438	8-Oct-08	White	50	1,289
6-Apr	Sacramento River: Rio Vista to Chipps Island	White	Yes	54	FF1445	9-Oct-08	White	45	1,275
8-Dec	San Pablo Bay	Unknown	No		ST12777	30-Sep-09	White	55	1,165
30-Mar	Suisun Bay	Unknown	No		1789	5-Oct-09	White	a	907
30-May	Montezuma Slough	White	Yes	53	HH1881	30-Aug-10	White	52	639
27-May	Suisun Bay	Unknown	No	56	ST12847	20-Sep-10	White	54	615
20-Apr	Sacramento River: Knights Landing to Rio Vista	White	Yes	58	HH1911	27-Sep-10	White	53	571
14-Apr	Napa River	White	Yes	54	1848	28-Sep-10	White	a	564
21-May	Napa River	White	Yes	52	ST13002	1-Aug-11	White	51	294
26-Mar	Sacramento River: Rio Vista to Chipps Island	White	Yes	50	HH2017	16-Aug-11	White	47	223
28-Apr	Suisun Bay	Unknown	No		ST13131	30-Aug-11	White	43	242
22-Sep	Grizzly Bay	White	Yes	54	ST13057	12-Sep-11	White	55	376
23-Mar	Sacramento River: Colusa to Knights Landing	Unknown	No		HH2151	22-Sep-11	White	67	183
14-Jan	Suisun Bay	White	Yes	54	HH2068	26-Sep-11	White	55	110
24-Nov	Suisun Bay	Unknown	No	70	ST13155	27-Sep-11	White	67	424
28-Mar	Sacramento River: Knights Landing to Rio Vista	White	Yes	66	ST13077	3-Oct-11	White	64	177
3-Mar	Suisun Bay	White	Yes	49	ST13081	4-Oct-11	White	49	151
11-Nov	Sacramento River: Rio Vista to Chipps Island	White	Yes	61	FF2167	11-Oct-11	White	59	397
4-Sep	Sacramento River: Knights Landing to Rio Vista	Unknown	No		HH2198	28-Aug-12	White	41	7
24-Nov	Sacramento River: Rio Vista to Chipps Island	Unknown	No	40	FF2211	17-Sep-12	White	41	68
10-Mar	Sacramento River: Knights Landing to Rio Vista	Unknown	No		64	b	b	b	b
7-Dec	Suisun Bay	Unknown	No		None listed	c	c	c	c
29-Nov	Sacramento River: Rio Vista to Chipps Island	Unknown	No		None listed	c	c	c	c
13-Dec	Sacramento River: Rio Vista to Chipps Island	Unknown	No		None listed	c	c	c	c
7-Dec	Sacramento River: Rio Vista to Chipps Island	Unknown	No		None listed	c	c	c	c
11-May	Sacramento River: Knights Landing to Rio Vista	Unknown	No		Cannot read	d	d	d	d
30-Jun	None listed	Unknown	No		64	b	b	b	b
14-Nov	None listed	Unknown	No		55	b	b	b	b

a) Cannot determine with partial tag number supplied (tag prefix could be either FF or HH)

b) Number provided is not a valid tag number (possibly angler was reporting length)

c) Angler reported catch in 'Sturgeon Released - Reward Disk Present' section but did not provide a tag number

d) Tag number is illegible / not valid (reported as what looks like 'W8')

Catch — Anglers reported releasing 175 green sturgeon, while keeping 1,701 white sturgeon and releasing 4,171 white sturgeon (Table 2). Nineteen (19) sturgeon were not identified to species.

Table 2. White sturgeon and green sturgeon catch reported on 2012 Cards

		White Sturgeon	Green Sturgeon	Unidentified Sturgeon	Overall Total
Retained	Measured	1,697	-	-	1,697
	Not Measured	4	-	-	4
	Total	1,701	-	-	1,701
Released	Measured	990	45	5	1,040
	Not Measured	3,181	130	14	3,325
	Total	4,171	175	19	4,365
Overall Total		5,872	175	19	6,066

One thousand two hundred eighty-one (1,281) anglers reported retaining white sturgeon (Table 3; average of 1.3 sturgeon). Eighty-one (81) anglers retained the limit of three white sturgeon.

One thousand one hundred seventy-nine (1,179) anglers reported releasing white sturgeon (Table 3). Of these anglers, 92 each released 10-30 fish, with 6 of the 92 each releasing 30 fish.

One hundred thirty-one (131) anglers reported releasing green sturgeon (Table 3; average of 1.3 sturgeon). Of these anglers, 27 each released 2-5 fish, and one angler reported releasing eight fish.

Table 3. Summary statistics for per-angler catch from 2012 Cards with catch data

	Number of Anglers	Number of Sturgeon	Maximum Number of Sturgeon per Angler	Average Number of Sturgeon per Angler
Retained White Sturgeon	1,281	1,701	3	1.3
Released White Sturgeon	1,179	4,171	30	3.5
Green Sturgeon	131	175	8	1.3
Unidentified Sturgeon	18	19	2	1.1

Of the 1,962 anglers who caught white sturgeon, 293² anglers retained and released white sturgeon on the same day (average = 1.8 anglers/day, maximum = 7 anglers/day). Of those 293 anglers, one released nine on the same day. Because the length of sturgeon released was not a required field on the Card, the number of white sturgeon voluntarily conserved could not be calculated.

Sixty-nine (69) percent of anglers who reported catching white sturgeon (N = 1,350), caught 1-2 fish each (Figure 1).

² Twenty-one (21) individual anglers retained and released white sturgeon on three separate days, 62 individual anglers retained and released white sturgeon on two separate days, and 210 individual anglers retained and released white sturgeon on one day.

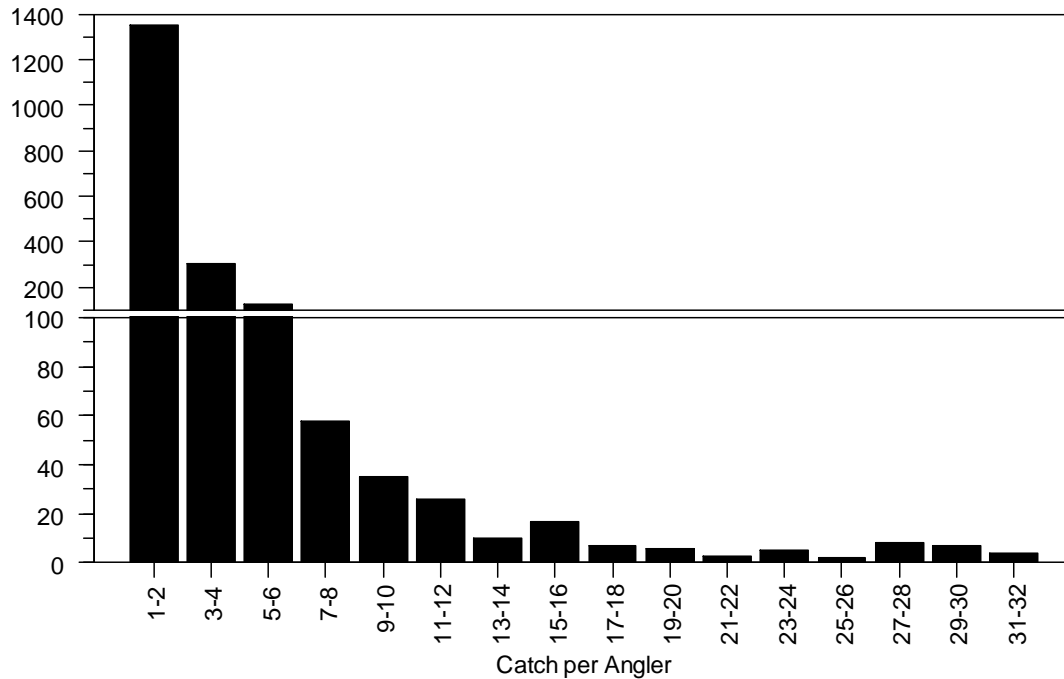


Figure 1. Frequency distribution of white sturgeon catch per angler as reported on 2012 Cards; y-axis break at 100 for ease of display

Lengths — Green sturgeon total length ranged 12-90 inches and averaged 36 inches (Figure 2). Retained white sturgeon total length ranged 46-66 inches (see Note 1 below) and averaged 56 inches (Figure 3). Released white sturgeon total length³ ranged 10-96 inches and averaged 43 inches (Figure 4).

Lengths of retained white sturgeon were fairly distributed around the middle of the slot limit (46-66 inches total length; Figure 3). Of the released white sturgeon for which a length measurement was reported, 183 were within the slot limit (Figure 4), the majority was below the slot limit (N = 681) and 126 were above the slot limit.

Note 1: Length not recorded for four retained white sturgeon

³ Length of released fish is not a required field, but many anglers volunteered the information.

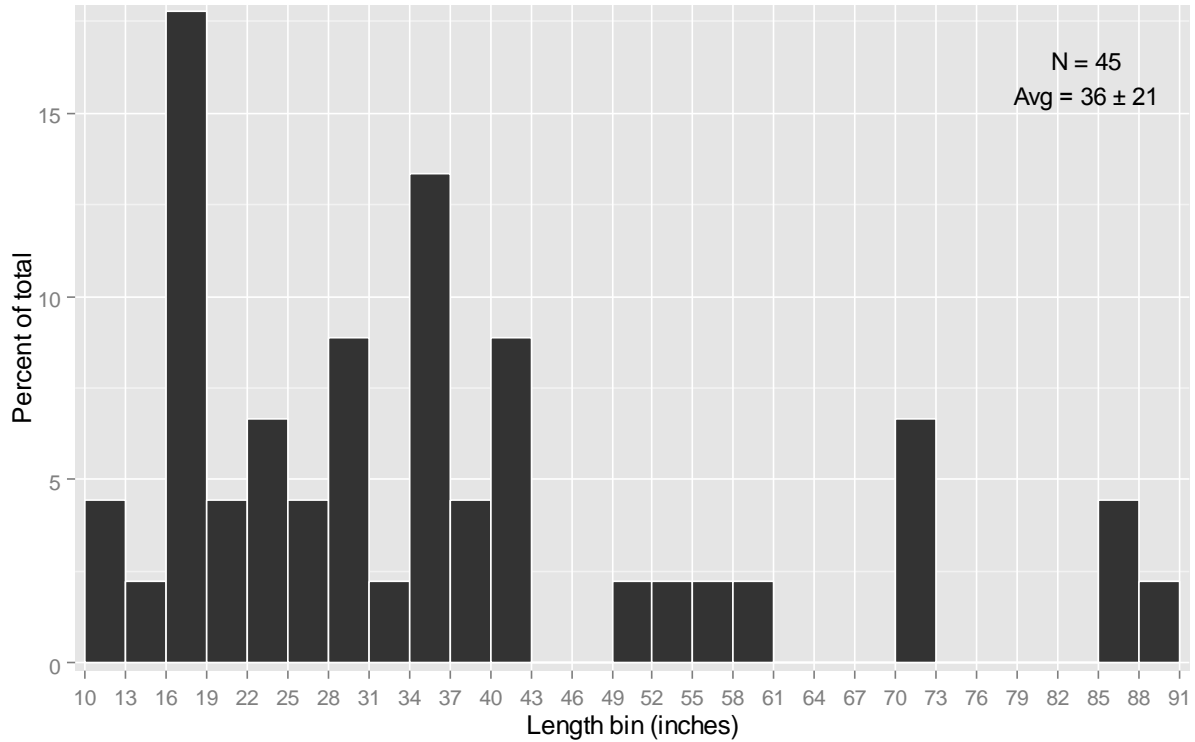


Figure 2. Length frequency distribution of green sturgeon reported on 2012 Cards

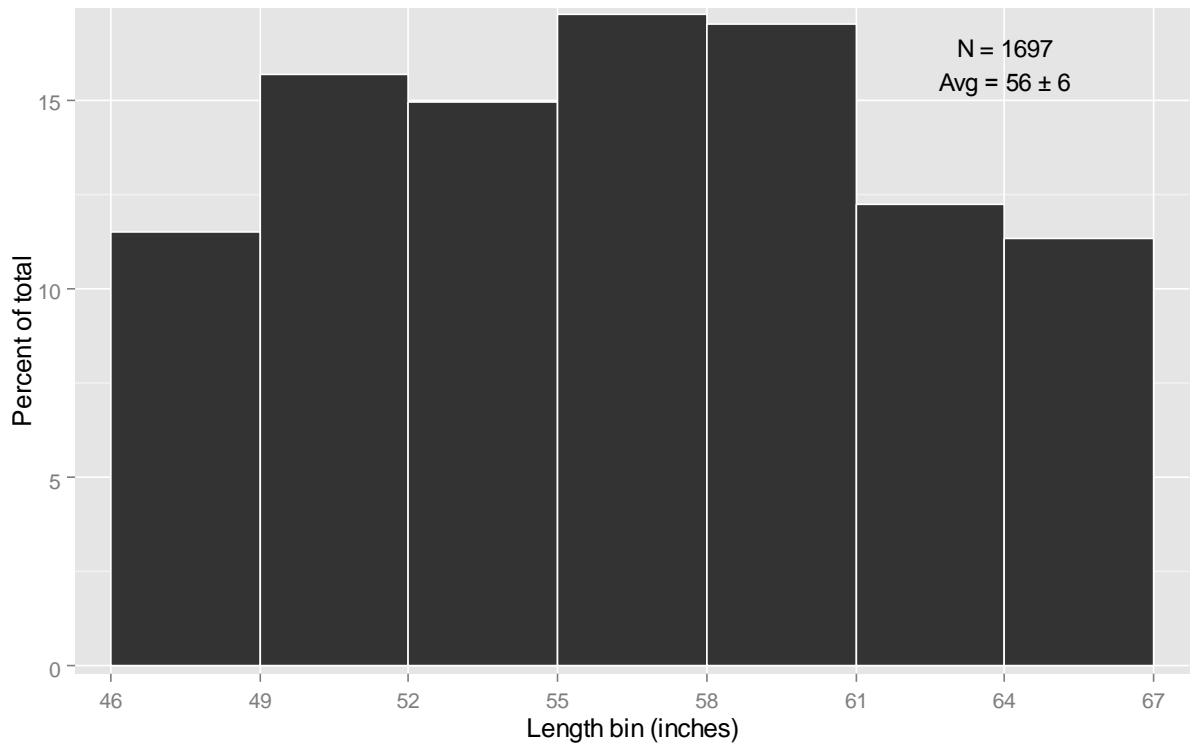


Figure 3. Length frequency distribution of white sturgeon retained as reported on 2012 Cards; figure does not included four retained white sturgeon with no reported length

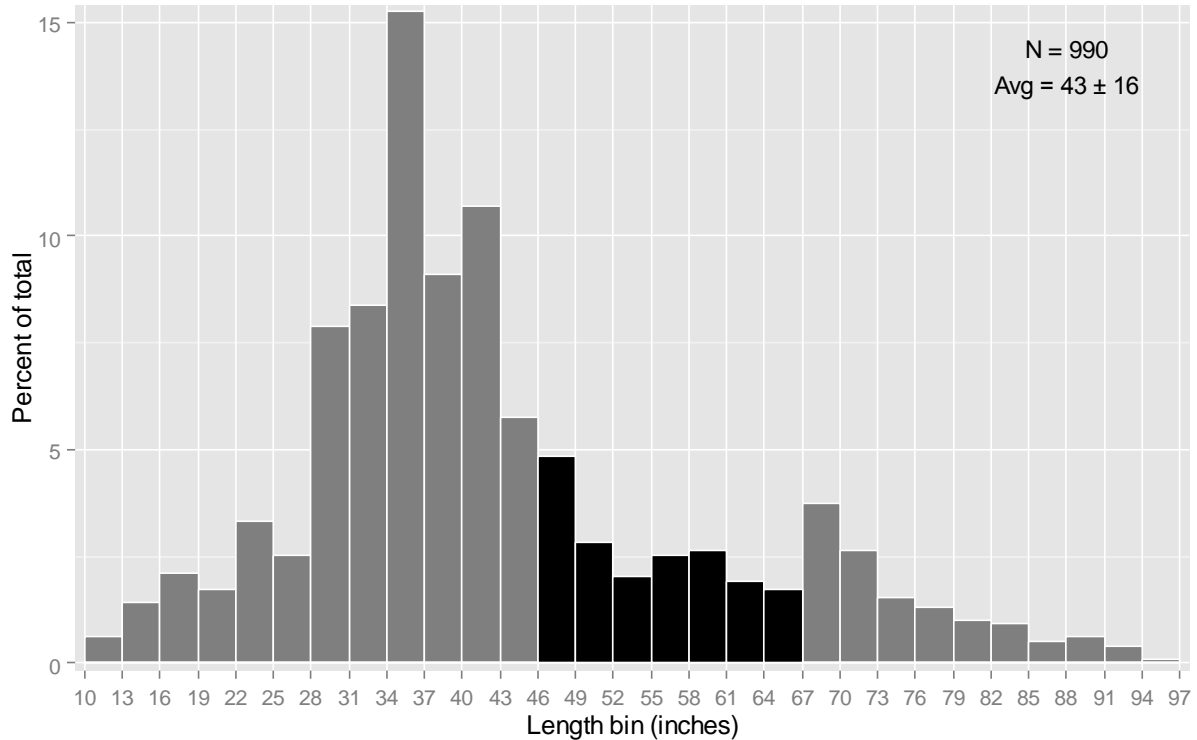


Figure 4. Length frequency distribution of white sturgeon released as reported on 2012 Cards (dark bars denote slot limit of 46–66 inches TL)

Seasonality — Catch per month ranged from approximately 12-14% of the total sturgeon catch (N = 6,066) for each of the following months: January; February; March; April; November; and December (Table 4). For all other months, catch was $\leq 7.5\%$ of total.

Table 4. Green sturgeon and white sturgeon catch per month for 2012

Month	White Sturgeon	Green Sturgeon	Unknown Sturgeon	Catch Total	Percent of Total
<i>Not given</i>	1			1	0.02%
January	717	14	2	733	12.1%
February	769	18		787	13.0%
March	725	20	3	748	12.3%
April	846	22	2	870	14.3%
May	395	9	2	406	6.7%
June	253	2	1	256	4.2%
July	116	8		124	2.0%
August	84	6		90	1.5%
September	141	11	1	153	2.5%
October	433	22		455	7.5%
November	692	24	4	720	11.9%
December	700	19	4	723	11.9%
Totals	5,872	175	19	6,066	

Locations — Sturgeon were collected from 27⁴ of the 28 locations listed on the Card (Figure 5; see note below). For the present purposes, locations where 1-50 sturgeon were collected were grouped as 'All Other Locations' (N = 16). Location codes were either not specified or were illegible (grouped as 'Unknown') for 7 retained white sturgeon, 4 released white sturgeon, and two unidentified sturgeon.

Note: For 12 entries (by eight anglers), Location was not reported. Of the eight anglers not recording Location, one angler fished Location 10 (Napa River) and the others did not report any Location.

Catch of green sturgeon was greatest in Suisun Bay and in the Sacramento River from Rio Vista to Chipps Island (Table 5). Catch of white sturgeon was greatest in Suisun Bay and in the Sacramento River from Rio Vista to Chipps Island (Tables 6 and 7).

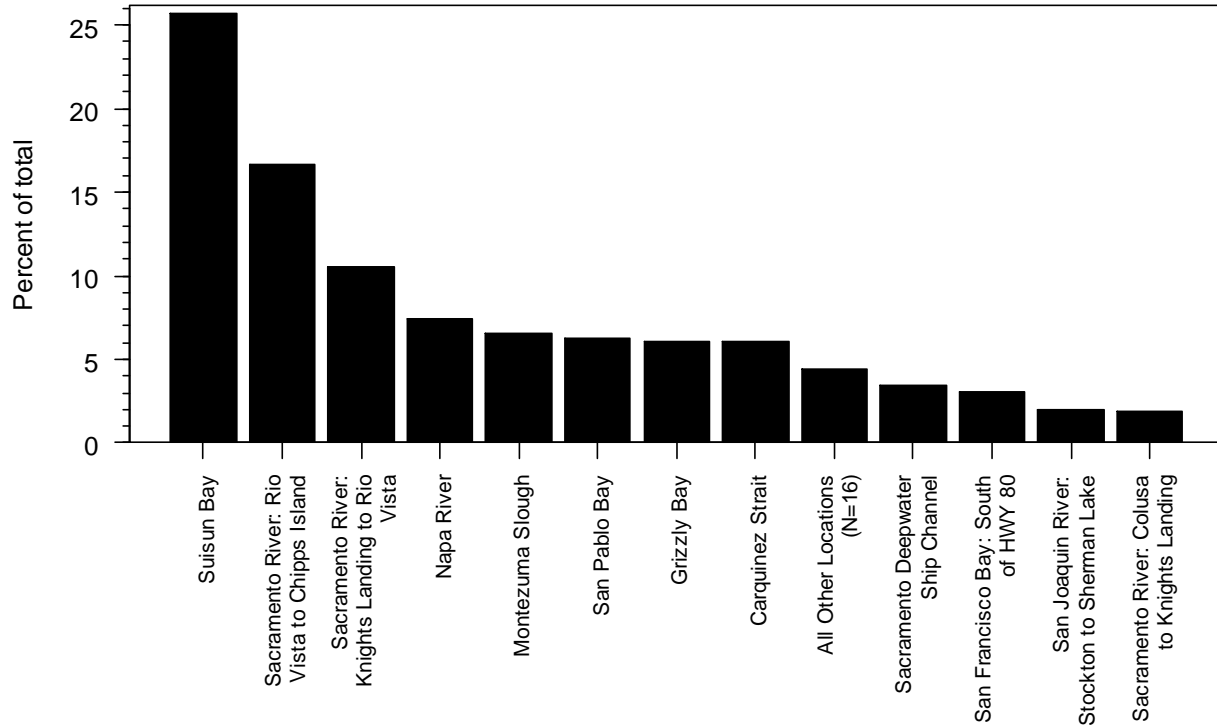


Figure 5. Percent of total catch of all sturgeon by location as reported on 2012 Cards

⁴ Absent was location '26' – Klamath River

Table 5. Green sturgeon catch and length statistics by location and season as provided on 2012 Cards. The five locations where total catch was highest were ranked. Seasons were defined as follows: Winter=December-February, Spring= March-May, Summer=June-August, Fall=September-November.

Location Code	Location Name	Rank of Catch	Number of Anglers	No Date of Capture	Winter Catch	Spring Catch	Summer Catch	Fall Catch	Total Catch	Number Measured	Minimum Length (inches)	Maximum Length (inches)	Average Length (inches)
	Unknown		-	-	-	-	-	-	-	-			
1A	Sacramento River: Upstream of Red Bluff		2	-	2	-	-	-	2	1	85	85	85.0
1B	Sacramento River: Red Bluff to Hwy 32 bridge												
1C	Sacramento River: Hwy 32 bridge to Colusa		4	-	-	4	-	-	4	1	90	90	90.0
2	Sacramento River: Colusa to Knights Landing		2	-	-	2	-	-	2	1	72	72	72.0
3	Sacramento River: Knights Landing to Rio Vista	4	17	-	5	8	-	4	17	5	18	56	38.2
4	Sacramento River: Rio Vista to Chipps Island	2	28	-	10	4	1	17	32	8	18	72	39.5
5	Feather River												
6	American River												
7	Sacramento Deepwater Ship Channel		2	-	-	1	-	1	2	-			
8	Yolo Bypass												
9	Montezuma Slough		4	-	1	4	1	-	6	3	12	60	28.0
10	Napa River	5	8	-	-	8	2	-	10	3	28	36	31.7
11	Petaluma River		1	-	-	2	-	-	2	2	40	42	41.0
12	San Joaquin River: Upstream of HWY 140 bridge												
13	San Joaquin River: HWY 140 bridge to Stockton												
14	San Joaquin River: Stockton to Sherman Lake												
15	Old River												
16	San Pablo Bay		6	-	4	2	-	-	6	-			
17	Carquinez Strait	3	9	-	8	3	3	6	20	-			
18	Suisun Bay	1	46	-	19	10	9	24	62	19	13	39	25.5
19	Grizzly Bay		8	-	2	1	-	5	8	-			
20	San Francisco Bay: North of HWY 80												
21	San Francisco Bay: South of HWY 80		1	-	-	2	-	-	2	2	52	86	69.0
22	Pacific Ocean: North of Golden Gate Bridge												
23	Pacific Ocean: Golden Gate Bridge to Point Sur												
24	Pacific Ocean: Point Sur to San Diego												
25	Any reservoir or lake												
26	Klamath River												
Totals			138*	-	51	51	16	57	175	45			

* = 7 anglers fished and caught a green sturgeon at 2 different locations, 131 anglers fished and caught a green sturgeon at 1 location

Table 6. Retained white sturgeon catch and length statistics by location and season as provided on 2012 Cards. The five locations where total catch was highest were ranked. Seasons were defined as follows: Winter=December-February, Spring= March-May, Summer=June-August, Fall=September-November.

Location Code	Location Name	Rank of Catch	Number of Anglers	No Date of Capture	Winter Catch	Spring Catch	Summer Catch	Fall Catch	Total Catch	Number Measured	Minimum Length (inches)	Maximum Length (inches)	Average Length (inches)
	Unknown		4	-	1	1	1	3	6	3	47	65	57.0
1A	Sacramento River: Upstream of Red Bluff		15	-	7	5	1	3	16	16	48	65	56.8
1B	Sacramento River: Red Bluff to Hwy 32 bridge		1	-	-	1	-	-	1	1	55	55	55.0
1C	Sacramento River: Hwy 32 bridge to Colusa		12	-	3	10	-	-	13	13	50	66	56.9
2	Sacramento River: Colusa to Knights Landing		53	-	30	37	-	-	67	67	47	66	58.0
3	Sacramento River: Knights Landing to Rio Vista	3	203	-	107	127	1	28	263	263	46	66	56.4
4	Sacramento River: Rio Vista to Chipps Island	2	248	-	104	69	5	135	313	313	46	66	55.5
5	Feather River		11	-	-	19	1	-	20	20	47	65	57.1
6	American River		1	-	-	-	-	1	1	1	66	66	66.0
7	Sacramento Deepwater Ship Channel		52	1	24	17	3	21	66	66	47	66	55.3
8	Yolo Bypass		10	-	2	3	1	5	11	11	50	66	54.7
9	Montezuma Slough		63	-	18	28	17	9	72	72	46	66	54.7
10	Napa River		75	-	18	59	4	5	86	86	46	65	57.0
11	Petaluma River		5	-	-	9	-	-	9	9	53	64	59.0
12	San Joaquin River: Upstream of HWY 140 bridge		5	-	2	1	-	2	5	5	47	61	52.8
13	San Joaquin River: HWY 140 bridge to Stockton		6	-	1	2	1	2	6	6	53	63	58.2
14	San Joaquin River: Stockton to Sherman Lake		18	-	5	7	2	7	21	21	47	65	55.8
15	Old River		4	-	2	-	-	2	4	4	46	66	55.8
16	San Pablo Bay	4	87	-	65	39	4	9	117	117	47	66	55.6
17	Carquinez Strait		69	-	26	29	17	14	86	86	46	66	55.5
18	Suisun Bay	1	258	-	105	121	26	65	317	316	46	66	55.7
19	Grizzly Bay		76	-	42	26	5	17	90	90	46	66	54.6
20	San Francisco Bay: North of HWY 80		6	-	4	1	1	1	7	7	48	62	53.9
21	San Francisco Bay: South of HWY 80	5	73	-	69	16	-	13	98	98	46	66	55.3
22	Pacific Ocean: North of Golden Gate Bridge		2	-	2	-	-	-	2	2	55	61	58.0
23	Pacific Ocean: Golden Gate Bridge to Point Sur												
24	Pacific Ocean: Point Sur to San Diego												
25	Any reservoir or lake		3	-	1	2	-	1	4	4	48	61	57.0
26	Klamath River												
Totals			1,360*	1	638	629	90	343	1,701	1,697			

* = 2 anglers caught and retained fish at 3 different locations, 75 anglers caught and retained fish at 2 different locations, 1,200 anglers caught and retained fish at 1 location, and 4 anglers did not report a location

Table 7. Released white sturgeon catch and length statistics by location and season as provided on 2012 Cards. The five locations where total catch was highest were ranked. Seasons were defined as follows: Winter=December-February, Spring= March-May, Summer=June-August, Fall=September-November

Location Code	Location Name	Rank of Catch	Number of Anglers	No Date of Capture	Winter Catch	Spring Catch	Summer Catch	Fall Catch	Total Catch	Number Measured	Minimum Length (inches)	Maximum Length (inches)	Average Length (inches)
	Unknown		3	-	3	1	-	-	4	2	32	47	39.5
1A	Sacramento River: Upstream of Red Bluff		9	-	3	6	1	1	11	3	30	88	51.3
1B	Sacramento River: Red Bluff to Hwy 32 bridge												
1C	Sacramento River: Hwy 32 bridge to Colusa		9	-	7	11	-	-	18	7	49	72	61.0
2	Sacramento River: Colusa to Knights Landing		26	-	12	31	-	2	45	12	40	86	69.1
3	Sacramento River: Knights Landing to Rio Vista	3	138	-	174	104	-	73	351	71	17	87	47.8
4	Sacramento River: Rio Vista to Chipps Island	2	216	-	221	142	16	282	661	139	12	92	41.4
5	Feather River		8	-	2	19	-	-	21	8	40	76	59.5
6	American River		4	-	5	4	-	1	10	-			
7	Sacramento Deepwater Ship Channel		55	-	40	32	2	63	137	56	16	93	47.1
8	Yolo Bypass		10	-	6	7	-	12	25	13	33	75	57.0
9	Montezuma Slough	5	100	-	75	149	67	31	322	123	12	87	44.3
10	Napa River	4	111	-	85	213	30	22	350	93	18	90	42.3
11	Petaluma River		20	-	9	16	3	6	34	6	32	65	43.2
12	San Joaquin River: Upstream of HWY 140 bridge		2	-	2	1	-	-	3	2	30	43	36.5
13	San Joaquin River: HWY 140 bridge to Stockton		2	-	-	2	-	1	3	3	65	91	73.7
14	San Joaquin River: Stockton to Sherman Lake		40	-	23	31	6	40	100	21	16	86	36.5
15	Old River		2	-	1	-	-	1	2	1	17	17	17.0
16	San Pablo Bay		107	-	151	81	11	17	260	72	13	96	42.8
17	Carquinez Strait		91	-	92	86	38	46	262	35	10	80	35.4
18	Suisun Bay	1	323	-	455	321	158	239	1,173	246	12	92	38.6
19	Grizzly Bay		103	-	111	65	31	63	270	34	20	60	38.1
20	San Francisco Bay: North of HWY 80		7	-	5	4	-	2	11	4	40	76	57.8
21	San Francisco Bay: South of HWY 80		47	-	59	8	-	19	86	35	24	74	48.5
22	Pacific Ocean: North of Golden Gate Bridge		1	-	-	-	-	1	1	-			
23	Pacific Ocean: Golden Gate Bridge to Point Sur		1	-	4	2	-	-	6	-			
24	Pacific Ocean: Point Sur to San Diego		1	-	-	1	-	-	1	1	58	58	58.0
25	Any reservoir or lake		2	-	3	-	-	1	4	3	12	32	23.3
26	Klamath River												
Totals			1,439*	0	1,548	1,337	363	923	4,171	990			

* = 1 angler caught and released fish at 6 different locations, 3 anglers caught and released fish at 5 different locations, 6 anglers caught and released fish at 4 different locations, 40 anglers caught and released fish at 3 different locations, 145 anglers caught and released fish at 2 different locations, 981 anglers caught and released fish at 1 location, and 3 anglers did not report a location

Discussion

Information from 2012 Cards includes the following highlights:

- (1) About 40% of the anglers who fished for sturgeon were not successful and successful anglers retained on average less than half the annual bag limit of three white sturgeon.
- (2) The fraction of unidentified sturgeon (0.3%) was about half of last year's and considerably lower than the record high (1.3%) of 2010.
- (3) Eight white sturgeon were reported to have been caught in Location 12 (San Joaquin River, upstream of Highway 140 Bridge) by 7⁵ anglers. Because occurrence of sturgeon in this reach of the San Joaquin River is rare, we attempted to contact each of those anglers but they either did not return our call or their phone number was no longer in service.
- (4) Recapture data (31 identified disk-tagged fish reported) will be used to augment mark-recapture data used by the Department's sturgeon population study, and thus are important for the precision and perhaps accuracy of estimates of abundance, harvest rate, and survival rate.
- (5) The length distribution of white sturgeon smaller than 40 inches reported by anglers suggests that annual production of white sturgeon was very low during the period 2007-2011. Low levels of white sturgeon production during those years was also suggested from indices of young-of-the-year white sturgeon abundance (DFW 2013) and was expected from the positive relationship between white sturgeon production and Delta outflow (Fish 2010).

Bibliography

DFW. 2013. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentId=69133>

Fish MA. 2010. A white sturgeon year-class index for the San Francisco Estuary and its relation to delta outflow. Interagency Ecological Program for the San Francisco Estuary Newsletter 23(2): 80-84. <https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentId=26542>

For more literature click on [additional bibliography](#).

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⁵ Was 14 anglers in total, but we confirmed — based on their description to us of where each was fishing — 7 of them had reported the incorrect location.

