Sturgeon Fishing Report Card: 2022 Summary Data Report

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Introduction

This technical document provides a summary of California Sturgeon Report Card (hereafter, Card) data. Since 2007, any angler fishing for sturgeon has been required to have a Card in their possession. It is part of a suite of sport fishing regulations intended to protect California's year-round White Sturgeon (*Acipenser transmontanus*) fishery while adding resiliency to the conservation-dependent population, as well as increase protections for the federally-threatened Green Sturgeon (*Acipenser medirostris*) population. Card data are complementary to on-going research and monitoring conducted by the California Department of Fish and Wildlife (CDFW) and other entities.

The sturgeon fishery in California has experienced major regulatory changes since the onset of the commercial industry in the late 19th century. Substantial population declines caused by commercial fishing led to a moratorium on the commercial and recreational sturgeon fishery from 1901-1910, with a brief re-opening from 1910-1917, followed by a second closure until 1953 (Pycha 1956). Only recreational sturgeon fishing has since been re-opened, albeit with increasing restrictions over time. From 1954-1963, anglers were permitted to take one sturgeon (either Green or White) per day each day of the year, only restricted by a 40 inch (101.6 cm) total length (TL) minimum size limit. Populations continued to decline as angling techniques for catching sturgeon improved in the 1980's, thus prompting the implementation of a maximum size limit of 72 inches (183 cm) TL in 1990. In 2006 the National Marine Fisheries Service (NMFS) determined that the southern Distinct Population Segment (DPS) of Green Sturgeon was at risk of extinction throughout their range, and subsequently listed the species as Threatened under the Endangered Species Act (ESA). Under growing concern for both Green and White Sturgeon, the California Fish and Game Commission voted to close the recreational fishery for Green Sturgeon in 2007. Around this time, new regulations were put in place to further protect White Sturgeon populations, including an annual bag limit of three fish and a reduction in the maximum size limit from 72 inches to 66 inches (167.6 cm) TL.

Current regulations state that all retained White Sturgeon must be within 40-60 inches (101.6-152.4 cm) fork length (FL), and anglers may keep only one fish daily and three annually. Only a single barbless hook is permitted for taking White Sturgeon and anglers must cease sturgeon fishing for the day after one is retained (California Code of Regulations (CCR), Title 14, Section 5.8 and 27.90). It is illegal to take or possess Green Sturgeon or remove them from the water if incidentally caught (CCR, Title 14, Section 5.81 and 27.91). To aid CDFW's efforts to reduce illegal commercialization of sturgeon and to enforce the daily and annual bag limits on White Sturgeon, each Card also includes detachable, single-use Card-specific tags to be placed on retained White Sturgeon. Anglers must record the day, month, and location for any sturgeon they catch and keep or catch and release, as well as length if kept. A 'Reward Disk' field is available should the angler catch a sturgeon with a CDFW-affixed disk tag (Figure 1). While interpreting the results of this report, please be aware of the following nuances:

(1) Card data are typically summarized in the spring and reported to the public in summer; however, annual summaries may change as additional report cards are returned to the Department and new data become available. The current summary year (typically one year behind current calendar year) is most affected by this. The most recent data extraction was 29-Jun-2023 @ 14:13.

(2) Reporting by anglers for the current valid Card (year 2023) is not due until 31-Jan-2024. Any summary of 2023 data is incomplete and should be used cautiously.

(3) From 2007-2017, CDFW produced single-year Card summary reports, available at https://wildlife.ca.gov/Conservation/Delta/Sturgeon-Study/Bibliography entitled *'YYYY' Sturgeon Fishing Report Card: Preliminary Data Report*. Updated annual summaries are found in this document, and CDFW will no longer produce single-year summaries.

(4) The Card was first made available March 1, 2007, and some anglers reported data for January and February of 2007. However, catch data for reported catches are incomplete and low for this period compared to subsequent years. Keep this in mind when interpreting the summaries reported here.

(5) For conciseness, location *codes* are displayed in figures and tables. For reference, please see Table 5 and Figure 12 in section 'Card Location Codes and Descriptions.'

Figure 1. Reward tags used for on-going sturgeon mark-recapture study.

Distribution and Return

Cards were issued free of charge from 2007-2012, and a fee of ~$8 was instituted in 2013. Until the establishment of the Automated License Data System (ALDS) in 2012, Cards were returned exclusively by mail. The ALDS offers anglers the option of reporting Card data online, a convenience that has been increasingly utilized over time (Table 1, see 'IS' or Internet Submission). Further, there has been an overall increase in reporting ('ReturnRate') since the onset of the program, though this seems to have stabilized in recent years (Table 1; ~31% from 2015 - 2022).

Table 1 field names explained below for reference.

Year: calendar year for which Card was issued (or sold, post 2012)

Issued: number of Cards issued (or sold)

Total Returned: number of Cards returned

No Effort: number of anglers reporting 'did not fish' (available from 2010)

No Catch: number of anglers reporting 'fished, but no catch'

Catch: number of anglers reporting catching one or more sturgeon

Return Rate: sum of the number of 'NoEffort', 'NoCatch', and 'Catch' divided by the number of cards 'Issued'

Not Returned: number of Cards not returned

CC: Control Center - Card mailed to CDFW and entered by CDFW staff

IS: Internet Submission - Card entered (reported) online by angler

Table 1. 2007-2022 Card distribution, return, and return rate. Did not fish ('NoEffort') was not an option 2007-2009. Automated License Data System was implemented in 2012, making Internet submission (IS) possible.

Year	Issued	Total Returned	No Effort	No Catch	Catch	Not Returned	CC	IS	Return Rate (%)
2007	37,680	6,919	NA	5,064	1,855	30,761	NA	NA	18.36
2008	53,777	7,329	NA	5,281	2,048	46,448	NA	NA	13.63
2009	72,499	8,558	NA	6,350	2,208	63,941	NA	NA	11.80
2010	66,357	7,515	1,482	4,275	1,758	58,842	NA	NA	11.33
2011	112,000	12,413	4,374	5,765	2,274	99,587	NA	NA	11.08
2012	112,800	12,637	5,382	5,203	2,052	100,163	10,797	1,844	11.20
2013	50,915	10,642	3,130	5,213	2,290	40,273	6,850	3,792	20.90
2014	49,260	12,076	3,258	6,173	2,645	37,184	5,984	6,094	24.51
2015	48,337	14,384	4,424	7,053	2,870	33,953	5,527	8,858	29.76
2016	47,617	15,677	6,129	6,685	2,997	31,940	4,497	11,181	32.92
2017	44,374	14,877	4,715	7,240	2,815	29,497	3,663	11,223	33.53
2018	44,146	14,382	4,863	6,977	2,398	29,764	2,884	11,498	32.58
2019	40,844	12,693	4,615	6,170	1,755	28,151	2,231	10,463	31.08
2020	44,079	13,958	5,041	6,730	2,010	30,121	2,028	11,931	31.67
2021	46,699	13,694	5,180	6,452	1,886	33,005	1,616	12,078	29.32
2022	39,461	11,504	4,557	5,153	1,645	27,957	1,271	10,233	29.15

Reported Catch

Anglers must report sturgeon catch, whether kept or released, while adhering to a bag limit of one White Sturgeon daily and three annually. Cards were initially categorized as 'catch' or 'no catch', but in 2010 a 'did not fish' check box was included. The Card provides species check boxes (White or Green) for fish that are released absent of a reward disk. An annual average of about 35 (± 25 SD) sturgeon cannot be identified to species given the available information. Anglers that return cards report keeping an average of 1,900 (± 426 SD) (mean ± standard deviation) White Sturgeon each year, and release 4,200 (± 1221 SD) White Sturgeon on average (Figure 2). Total catch of White sturgeon reached a high in 2015 at 8,632 fish caught, and has steadily declined to a low of 3,697 in 2021 (Figure 2).

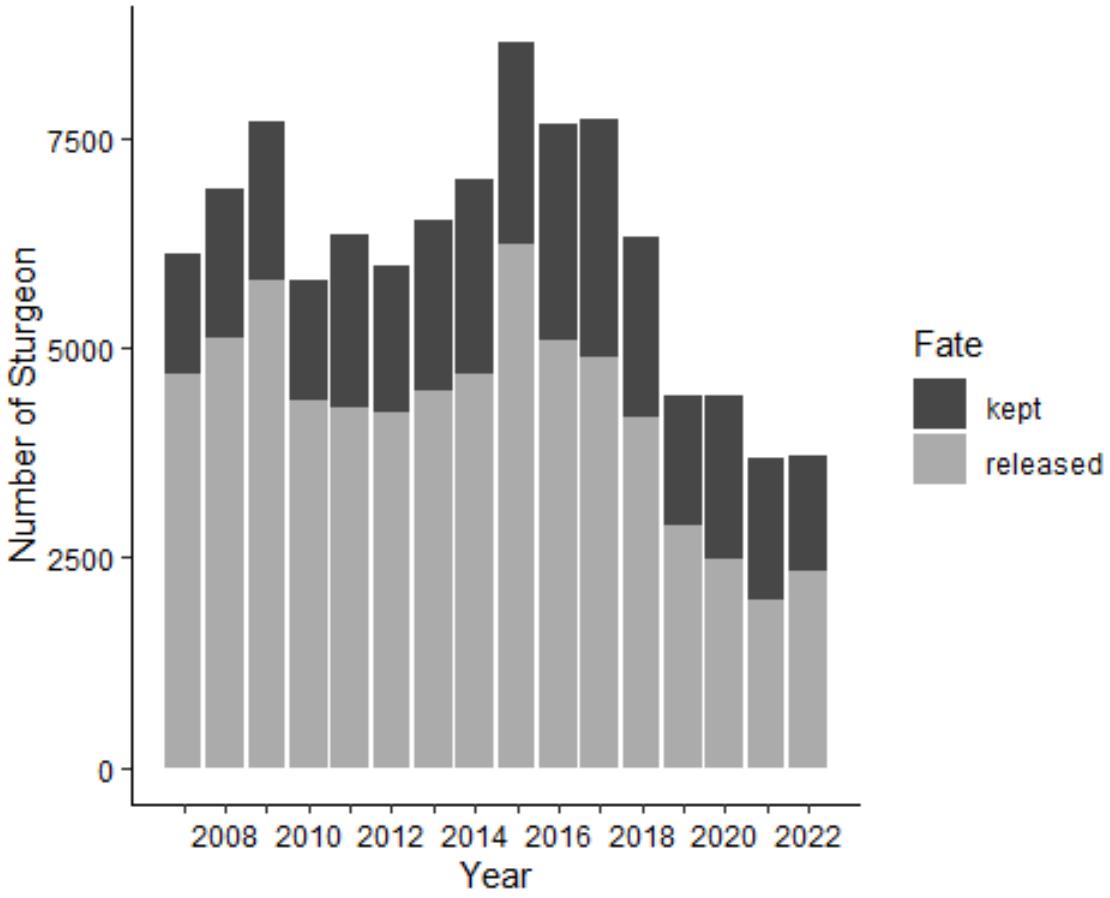

Figure 2. 2007-2022 Annual White Sturgeon catch (kept & released) from reported Cards.

Anglers continue to release more sturgeon than they keep, however this ratio is shifting overtime. Since the onset of the card program, the proportion of total catch that is harvested has significantly increased while the proportion of catch that is released has decreased (Figure 3, $p < 0.001$). These results indicate that over time, anglers are harvesting more White Sturgeon relative to the total amount caught.

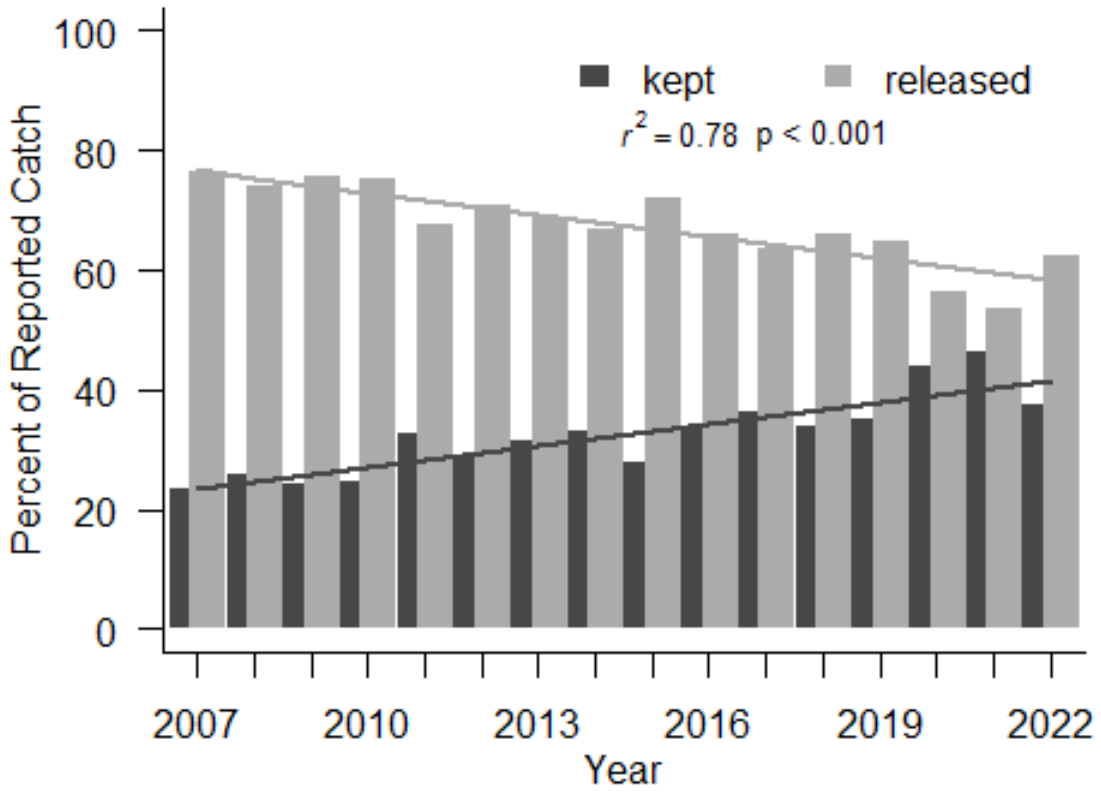

Figure 3. 2007-2022 Annual proportion (presented as a percent) of White Sturgeon released vs harvested (kept) out of the total caught.

Green Sturgeon are bycatch in the White Sturgeon fishery, and anglers are prohibited from keeping any that are caught. On average, anglers report releasing about 180 (± 50 SD) Green Sturgeon each year (Figure 4).

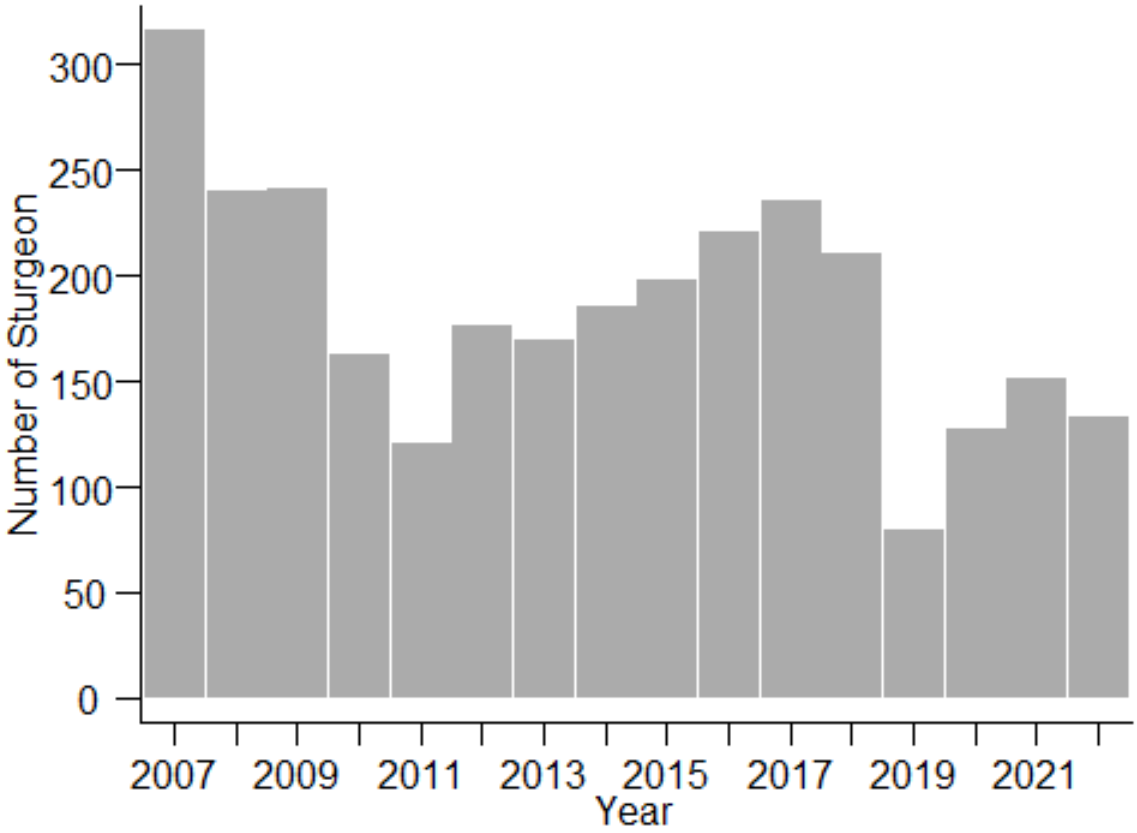

Figure 4. 2007-2022 Annual Green Sturgeon bycatch from reported Cards.

Catch per Angler

Of the anglers who report fishing for sturgeon, the majority do not catch any fish (74% ± 3.6 SD; Figure 5). On average, about 19% (± 1.9 SD) catch one or two White Sturgeon per year (includes both kept and released) and few anglers (<7%) catch three or more (Figure 5).

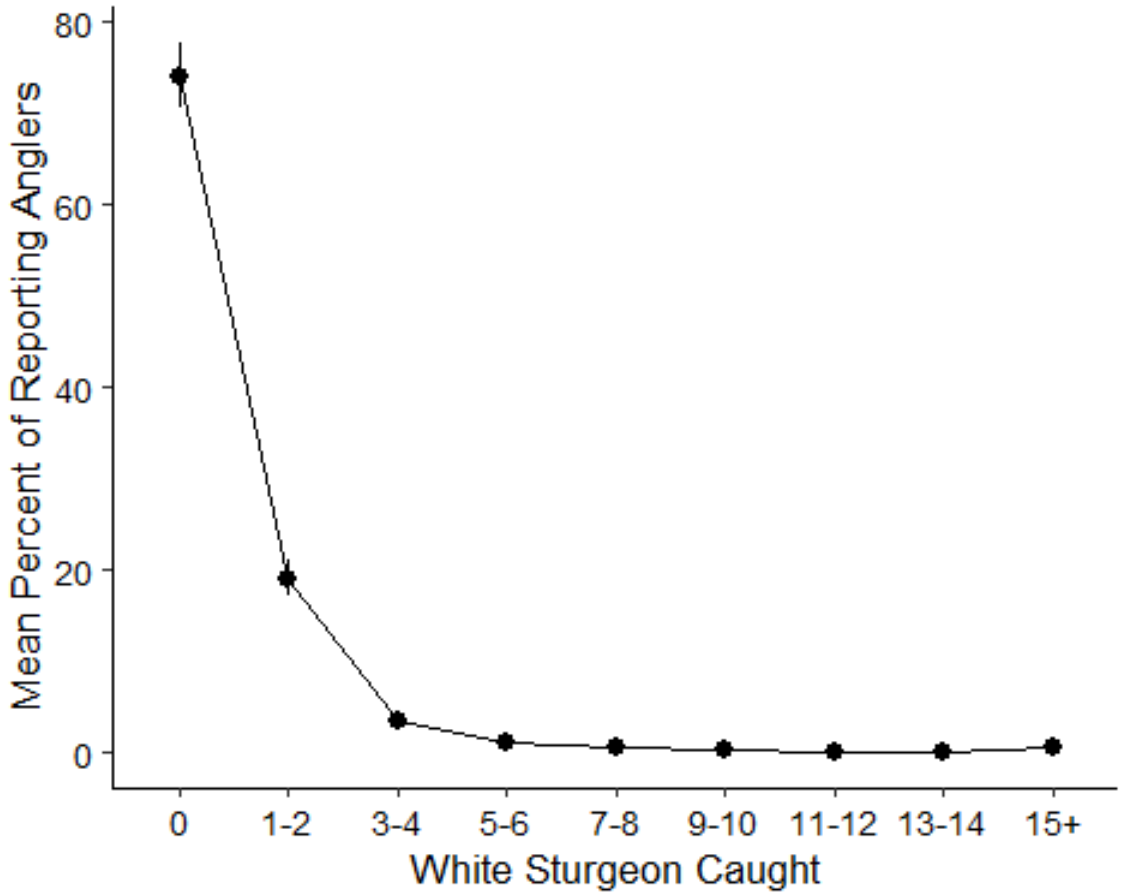

Figure 5. 2013-2022 Mean percent of all anglers that report catching White Sturgeon (kept or released). Points mark the fraction (represented as a percent) of total anglers who report fishing for sturgeon, averaged across 2013-present. Vertical lines represent the standard deviation. Zero (0) White Sturgeon caught represents the average percent of anglers that fish but do not catch any sturgeon; calculation does not include anglers who reported 'did not fish.'

2013-present

From 2013-present day, Card reporting has consistently offered anglers three categories for fishing: (1) did not fish, (2) fished but no catch, and (3) fished (& caught fish). Out of the anglers expending fishing effort (ie. all anglers except those that 'did not fish'), 1.4% (0.014 ± 0.003 SD) (n ≥ 1000 reporting) catch and release at least one Green Sturgeon (Table 2) on average each year. Some anglers catch and release more than one Green Sturgeon annually, though these numbers are relatively low (Table 2, see 'Max' field).

Table 2. 2013-2022 Annual fraction of all reporting anglers who caught and then released one or more Green Sturgeon. 'Max' denotes maximum annual catch for one angler.

Year	Anglers	Fraction	Max
2013	120	0.0160	7
2014	137	0.0155	7
2015	151	0.0152	5
2016	157	0.0164	5
2017	154	0.0152	8
2018	141	0.0148	15
2019	61	0.0076	3
2020	100	0.0112	7
2021	109	0.0128	5
2022	105	0.0151	6

Across all years (2013 - 2022), 27%-40% of all reporting anglers reported 'did not fish' (ie. "No Effort", Figure 6). Out of all reporting anglers (n ≥ 1000; including 'did not fish'), the majority do not harvest any White Sturgeon (54% ± 2.8 SD). About 9% (± 1.2 SD) on average keep one White Sturgeon, 2% (± 0.06 SD) keep two sturgeon, and even fewer keep the limit of three (< 0.7% ± 0.21) (Figure 6).

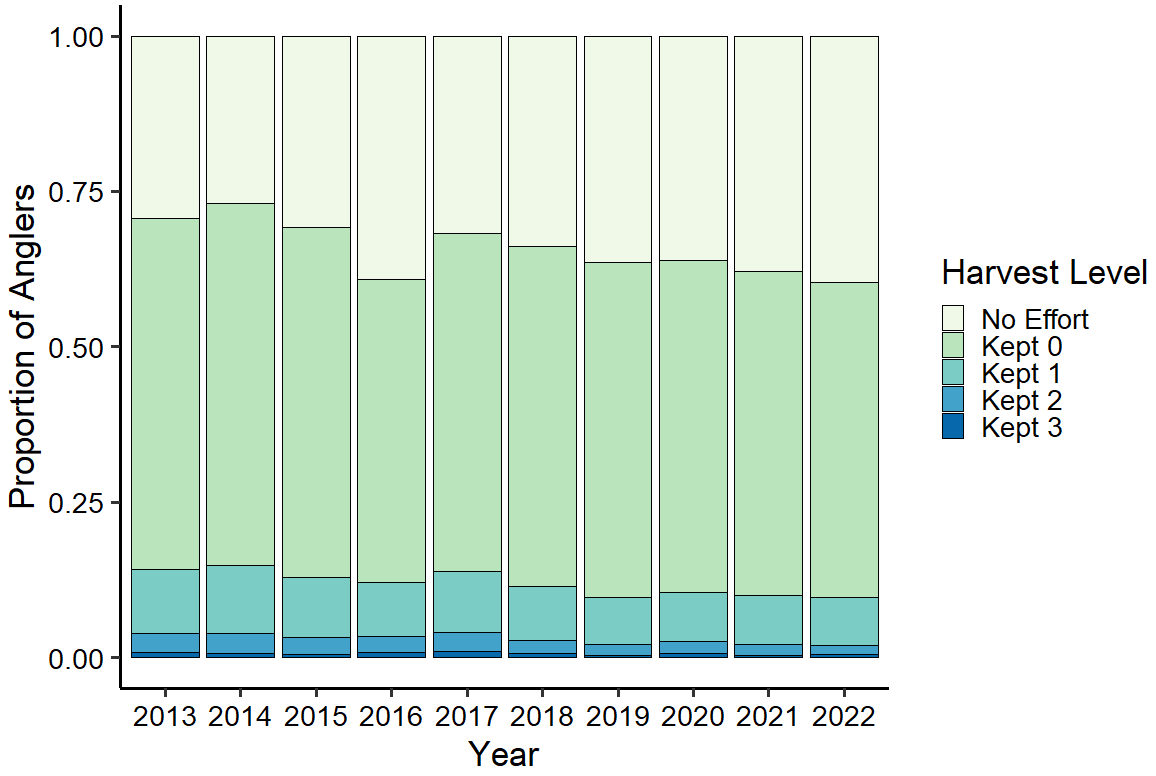

Figure 6. 2013-2022 Annual proportion of all reporting anglers that keep 0, 1, 2, or 3 White Sturgeon. 'NoEffort' denotes anglers reporting 'did not fish.'

Given the available data, it is not possible to identify the fraction of anglers that exclusively practice 'catch-and-release' fishing. However, 6.0%-10.1% (mean = 8.1% ± 1.6 SD) of reporting anglers that expended fishing effort released sturgeon without retaining any that were caught (2013-2022, years with ≥ 1000 reporting). This fraction has significantly decreased over time, indicating that fewer anglers are reporting only releasing fish out of the anglers that report catching a sturgeon (Figure 7, $p < 0.01$).

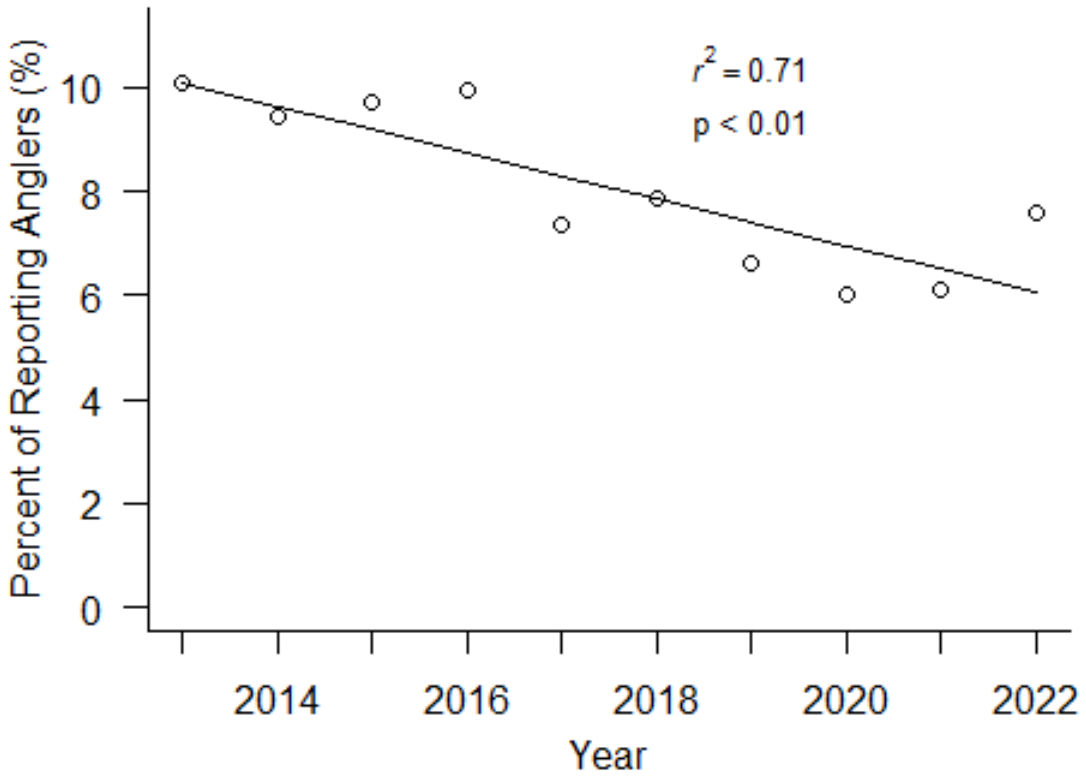

Figure 7. 2013-2022 Percent of anglers that report catching one or more sturgeon yet retaining none.

Length

The current slot size for harvesting a White Sturgeon is 40-60 inches (101.6-152.4 cm) FL, and anglers are required to report length for fish that are retained. Anglers report inches, as required by regulations, but lengths were converted to centimeters FL for this report. Occasionally, an angler will report a suspiciously small length (i.e., ≤ 10). In doing so, the angler is most likely using shorthand to report catch (i.e. number caught). Therefore, any "length" ≤ 10 inches is flagged as invalid and set to NA for analytical purposes. Since the start of the Card program, the number of invalid lengths reported each year is typically low (0-15 lengths).

Green Sturgeon

While anglers are not required to report the length of fish that are released (Green or White), some include this information in the species check box. Of the valid lengths reported, most Green Sturgeon caught are less than 100 cm (~ 40 inches; Figure 8), with an average length of 84 (± 36.5 SD) cm FL. An increase in reported catch of Green Sturgeon in

recent years (Figure 4), as well as in average length in 2021 - 2022 (mean = 100 and 108 cm FL, respectively), may indicate a year class growing into the fishery.

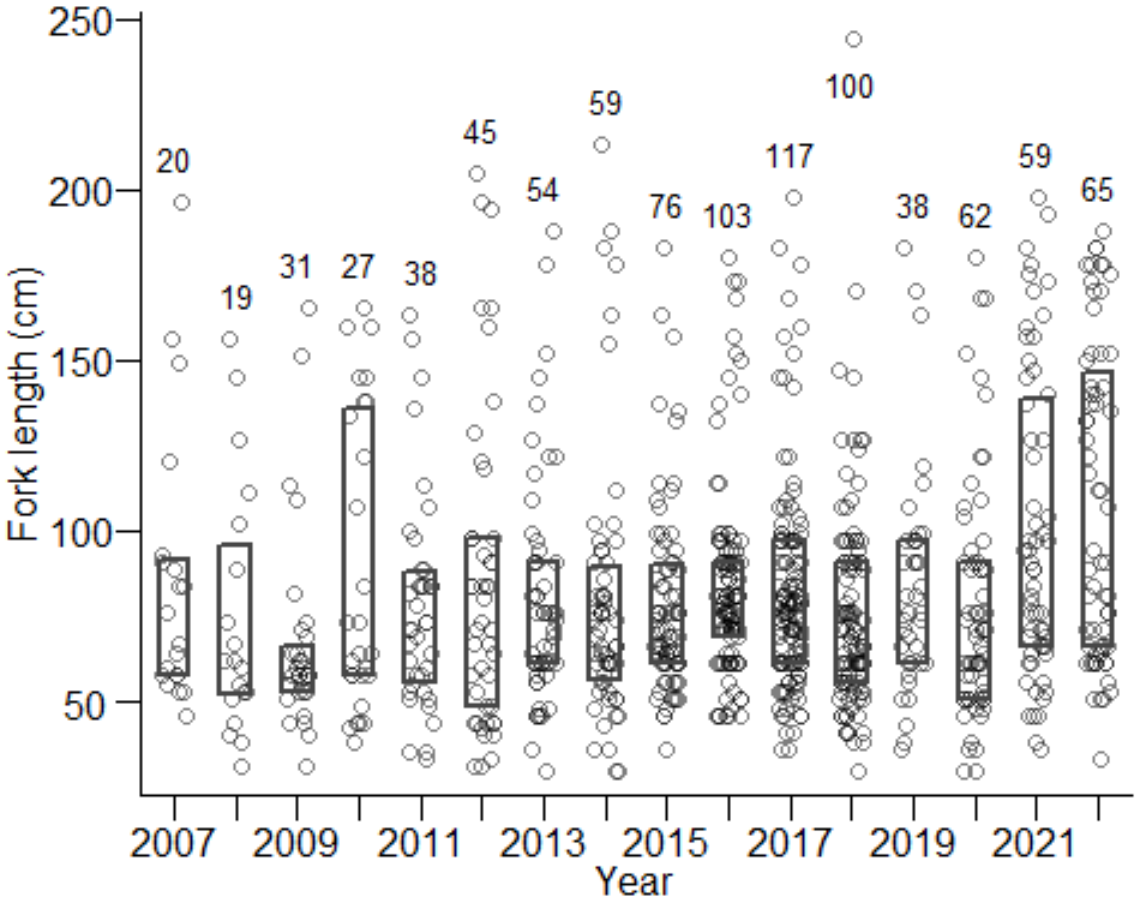

Figure 8. 2007-2022 Reported Green Sturgeon lengths (cm). Bottom and top of box denotes 25th and 75th percentile, and numbers indicate the count of Green Sturgeon measured. Note: noise added to x-axis to minimize over-plotting.

White Sturgeon

Released

Length distributions for released White Sturgeon show that annual median values are typically below 102 cm FL (mean of ~95 cm FL), which is associated with the lower boundary of the slot (Figure 9, see 'x' on figure). The annual trend of progressively darker points below the slot appears to indicate that anglers have been catching more sub-slot sized fish, reporting measurements of more sub-slot sized fish, or a combination of both (Figure 9). Additionally, each year anglers released White Sturgeon that legally could have been retained, thus providing evidence for 'catch-and-release' fishing activity (Figure 9).

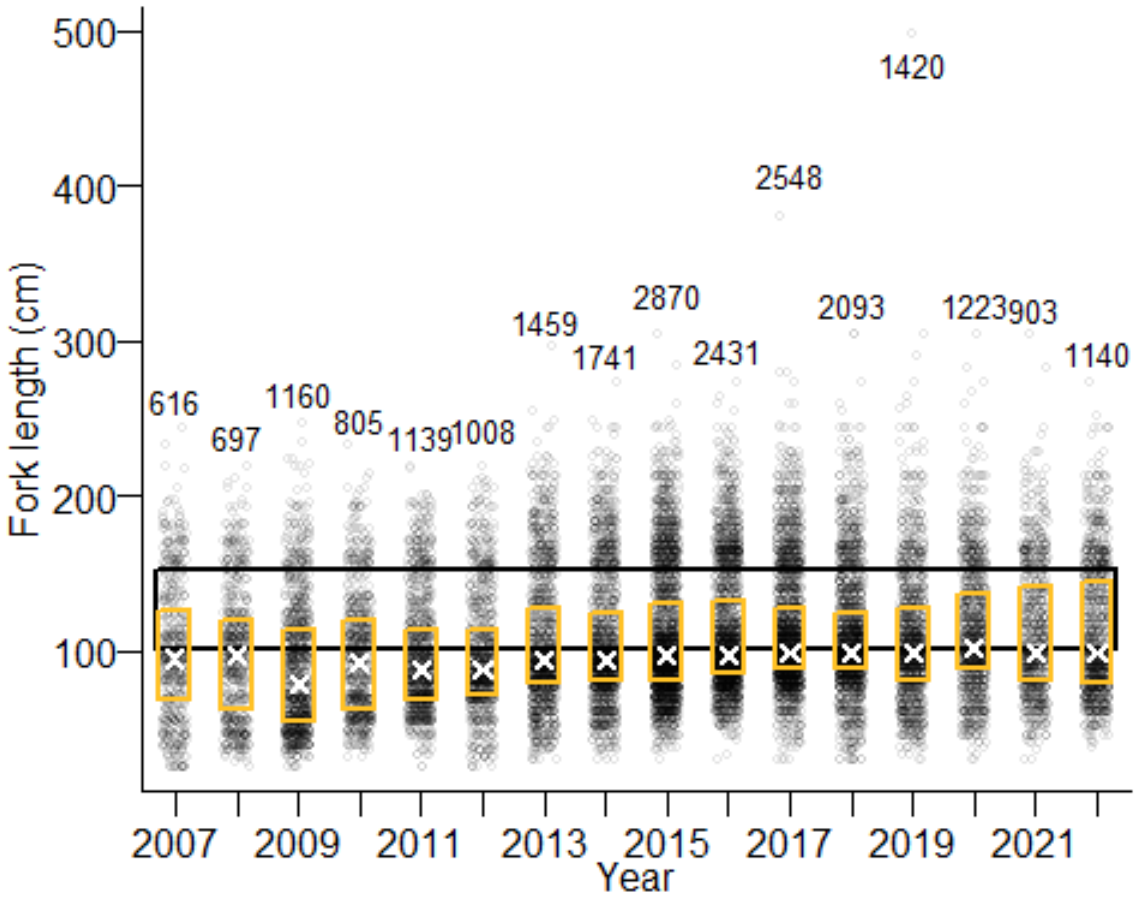

Figure 9. 2007-2022 Reported released White Sturgeon lengths (cm). Bottom and top of vertical boxes denote the 25th and 75th percentile, 'x' denotes median. Horizontal box represents the current slot limit 101.6-152.4 cm FL (40-60 inches FL), and numbers indicate the count of released White Sturgeon measured. Note: noise added to x-axis to minimize over-plotting.

Kept

The distribution of length quartiles (25-75%) indicates interannual variation in the size of harvested White Sturgeon (Figure 10). For example, it appears that reporting anglers harvested more fish with lengths closer to the upper slot limit in 2012-2014, versus sizes closer to the lower end of the slot in 2016-2018 (Figure 10). Average FL of harvested sturgeon has increased in recent years (2019 - 2022), potentially indicating a year class (or classes) growing into and out of the slot limit (101.6-152.4 cm or 40-60 in FL).

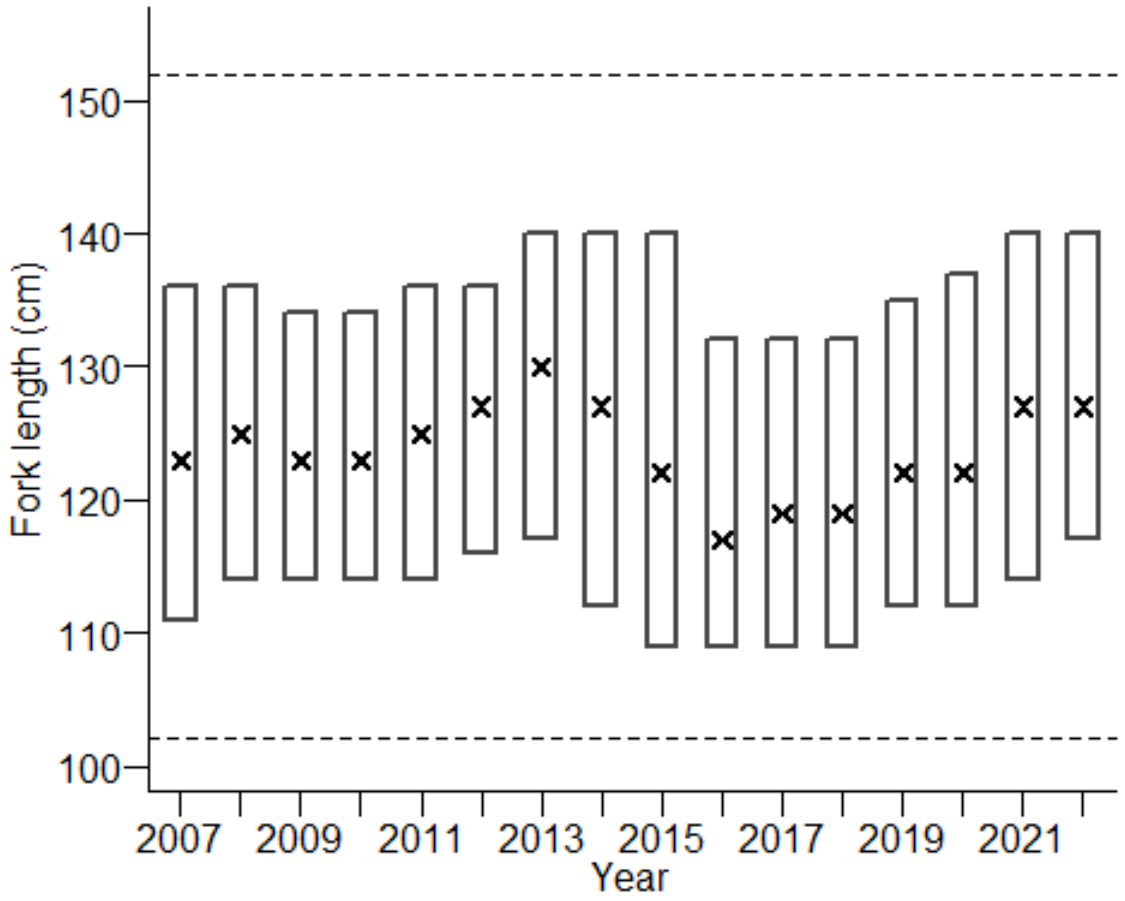

Figure 10. 2007-2022 Lengths (cm) of White Sturgeon that were harvested (ie. reported as 'kept'). Bottom and top of vertical boxes denote the 25th and 75th percentile, 'x' denotes median. Dashed lines mark the upper and lower bounds of the slot limit (101.6-152.4 cm FL or 40-60 inches FL). Note: Nearly all 'kept' fish (See Figure 2) were measured, as required by regulations.

Catch by Month & Location

Anglers are required to report the date and location of any sturgeon (Green or White; kept or released) that are caught, thus making coarse spatial and temporal analyses possible. This section explores these analytics for all White Sturgeon (kept & released). Numerical location codes are defined in Table 5.

Month: White Sturgeon

Though the White Sturgeon fishery is open year-round, there appears to be a natural seasonality in catch that coincides with the timing of winter spawning migrations into the Sacramento-San Joaquin Delta and lower rivers (Figure 11). Catch as a fraction of total caught is lowest in the late spring through summer and tends to be highest in the late fall

through the early spring (Figure 11). Note that calculations do not take fishing effort into account, as these data are not currently available.

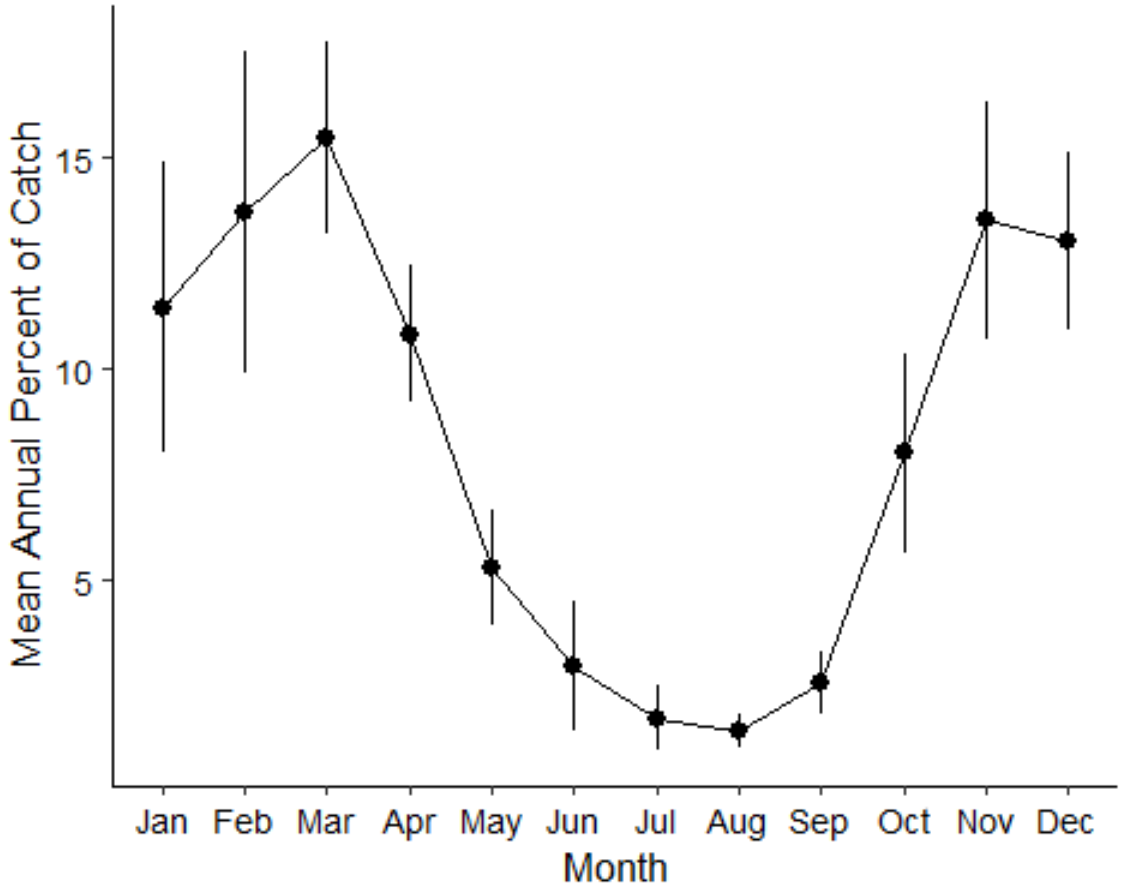

Figure 11. 2007-2022 Mean annual percent of White Sturgeon catch by month, vertical bars represent standard deviation. Calculations do not take effort into account. Additionally, the Card was not required until 01-Mar-2007, so data from January and February of that year is likely incomplete.

Location: Ranking Top 5 for White Sturgeon

Suisun Bay (code 18; Figure 12) consistently yields the greatest fraction of White Sturgeon catch (22% - 42%) by a margin of 5% - 29% (with the exception of 2008; Table 3). The region spanning Rio Vista to Chipps Island in the Sacramento River (code 04; Figure 12) also results in relatively high catch of White Sturgeon (Table 3).

Table 3. 2007-2022 Annual top 5 ranking of locations with highest White Sturgeon catch. Number represents the location code, and percent of total is denoted in parentheses.

Year	First	Second	Third	Fourth	Fifth
2007	18 (23)	04 (17)	09 (12)	16 (7)	03 (7)
2008	04 (21)	18 (20)	09 (10)	03 (9)	16 (6)
2009	18 (28)	04 (18)	09 (9)	03 (7)	14 (6)
2010	18 (25)	04 (20)	10 (7)	16 (6)	17 (6)
2011	18 (22)	04 (15)	16 (14)	10 (10)	03 (9)
2012	18 (25)	04 (16)	03 (10)	10 (7)	09 (7)
2013	18 (26)	04 (17)	03 (11)	09 (10)	16 (7)
2014	18 (28)	04 (15)	03 (11)	09 (10)	10 (7)
2015	18 (30)	04 (16)	09 (12)	03 (8)	16 (6)
2016	18 (29)	04 (17)	09 (13)	10 (7)	03 (6)
2017	18 (34)	16 (16)	09 (11)	04 (11)	19 (8)
2018	18 (40)	09 (11)	04 (10)	16 (8)	19 (7)
2019	18 (37)	09 (12)	16 (11)	10 (8)	04 (7)
2020	18 (39)	04 (13)	09 (10)	10 (7)	19 (7)
2021	18 (42)	04 (13)	09 (12)	19 (5)	03 (5)
2022	18 (42)	04 (16)	09 (9)	19 (5)	02 (5)

Angler Tag Returns

In 2010, CDFW added a field for reporting the disk tag number, if present. Angler-reported disk tags are used to augment mark-recapture data in an effort to improve the accuracy in estimating population metrics such as harvest rate and abundance. Some anglers recorded this information starting in 2009 despite the absence of an official field (Table 4). Disk tags consist of a two-letter prefix followed by series of numbers (e.g. HH1234); the prefix represents the reward value (e.g. 'HH' = $100). Ideally, an angler should report the entire alpha-numeric ID, but some tag codes are not completely reported (Table 4). To date, anglers have reported 41 disk tags with too few or too many digits to make a positive match with CDFW release data. Table field names are explained below for reference.

- **Anglers**: Number of anglers reporting a disk tag or possible disk tag.
- **Good Tag**: Count of complete disk tags (angler correctly reported disk tag).
- **No Prefix**: Count of disk tags reported without the two-letter prefix; likely a valid disk tag but further investigation is required.

- **Prefix 'ST'**: Count of disk tags reported as 5-digits, no prefix. In the past, CDFW released some $20 disk tags with 'ST' followed by 5 digits. These are likely $20 tags but additional investigation is required.
- **Reward Only**: Count of likely disk tags but no number available. Angler reported reward value only (e.g., $50.00).
- **Zip Only**: Count of likely disk tags but no number available. Angler reported Stockton zip code (the CDFW Stockton address is printed on the opposite side of the disk tag number).

Table 4. 2007-2022 Annual count of anglers who reported catching a disk-tagged sturgeon and number of tags based on completeness of reported disk number.

Year	Anglers	Good Tag	No Prefix	Prefix 'ST'	Reward Only	Zip Code
2009	5	3	0	1	0	0
2010	34	23	11	2	0	0
2011	37	27	9	3	0	0
2012	34	23	3	5	0	0
2013	30	24	4	3	0	1
2014	40	26	8	1	1	2
2015	36	21	7	0	2	1
2016	22	18	1	0	0	0
2017	28	23	1	1	1	0
2018	29	21	0	2	0	1
2019	10	9	0	0	0	0
2020	20	15	1	1	0	0
2021	23	16	1	0	1	1
2022	20	18	0	0	0	0

Additional Information and CDFW Contacts

Please visit following webpages for more information on:

- *Past years card reporting results and sturgeon study literature*: https://wildlife.ca.gov/Conservation/Delta/Sturgeon-Study/Bibliography
- *Sturgeon biology, status, and threats*: https://wildlife.ca.gov/Conservation/Fishes/Sturgeon
- *Visit the Sturgeon Report Card webpage*: https://wildlife.ca.gov/Conservation/Fishes/Sturgeon/report-card

CDFW contact: sturgeon@wildlife.ca.gov

Card Location Codes & Descriptions

The fishing locations referenced in this report are included below.

Table 5. 2007-2022 Sturgeon Report Card Location Codes as listed on the Card. Note: codes 2-9 appear on Card with a leading 0 (e.g., 03).

Card Code	Card Description
1	Sacramento River: Red Bluff to Colusa (2007-2009)
01A	Sacramento River: Upstream of Red Bluff
01B	Sacramento River: Red Bluff to Hwy 32 bridge
01C	Sacramento River: Hwy 32 bridge to Colusa
2	Sacramento River: Colusa to Knights Landing
3	Sacramento River: Knights Landing to Rio Vista
4	Sacramento River: Rio Vista to Chipps Island
5	Feather River
6	American River
7	Sacramento Deepwater Ship Channel
8	Yolo Bypass
9	Montezuma Slough
10	Napa River
11	Petaluma River
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
17	Carquinez Strait
18	Suisun Bay
19	Grizzly Bay
20	San Francisco Bay: North of HWY 80
21	San Francisco Bay: South of HWY 80
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

Card Code	Card Description
25	Any reservoir or lake
26	Klamath River

Figure 12 provides spatial representation of Card location codes, current as of 2023. Please reference the 'Regulations at a glance' section of the Sturgeon Report Card web page for more information on seasonal and permanent closures to sturgeon fishing.

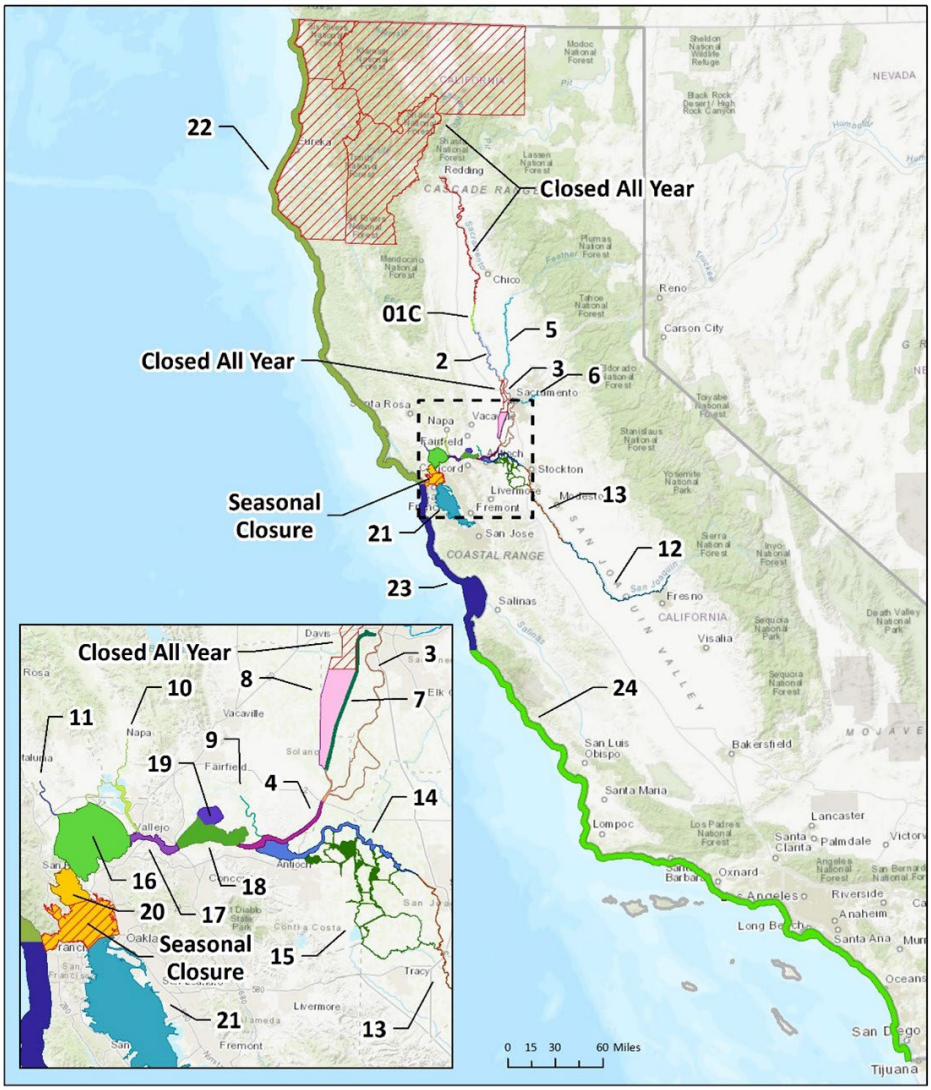

Figure 12. 2007-2022 Map of Card locations, see Table 5 for numerical code descriptions. Location codes 01A, 01B, and 26 are closed to fishing and are not labeled on map.

Literature Cited

Pycha, R.L. 1956. Progress report on white sturgeon studies. California Fish and Game 42: 23-35.