

2009 Adult Striped Bass Tagging Cruise Report

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

by Jason DuBois and Ryan Mayfield

June 15, 2009

Cruise Dates: April 1, 2009 – May 21, 2009

Project: Adult Striped Bass Monitoring Project as conducted by the California Department of Fish and Game (Bay-Delta Region; Stockton, CA)

Objective: To tag adult striped bass and document previously-tagged fish for an ongoing mark-recapture program designed to estimate abundance, harvest rate, and mortality rate.

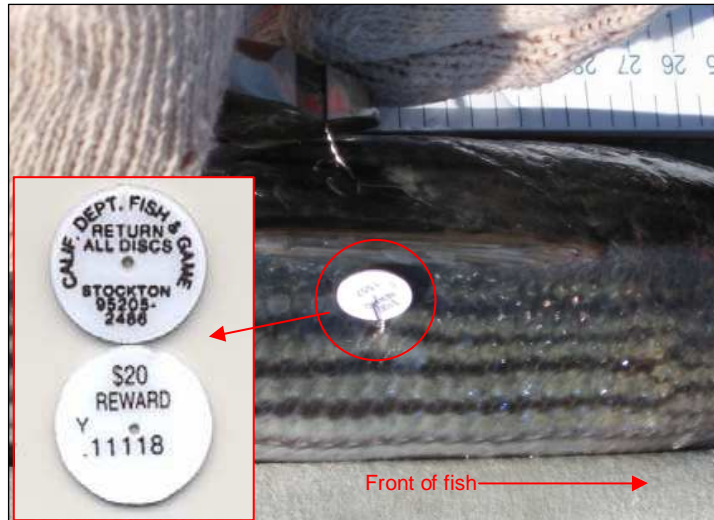
Methods and Gear

Overall

Fyke traps and gill nets were used to collect fish for the 2009 Striped Bass Tagging Season. The season lasted eight weeks, beginning April 1 and ending May 21. Note: Gill netting was not performed during Week 3 (April 12 – April 18).

California Department of Fish and Game staff, one US Fish and Wildlife staff, and a volunteer participated in this project (Appendix 1). Tagging was performed per procedure outlined in Appendix 2 of the Sacramento-San Joaquin Sport Fish Management Striped Bass Population Study Quality Control and Operating Manual.

Striped bass were measured to the nearest centimeter fork length (cm FL). Fish greater than or equal to 42 cm FL¹ were sexed and fitted with a Petersen disk-dangler tag (see photo below of disc tag as it was applied to the fish; inset is example of the two sides of the tag). Each tag possessed a unique 6-digit numeric or alpha-numeric identifier and the location of the Fish and Game office to where the tag should be returned. To evaluate return-rate, alpha-numeric tags posted rewards of \$20 (example shown), \$50, or \$100 and ~10% of all tags applied were reward tags. Sub-legal sized fish (< 42 cm FL) were enumerated but not sexed or tagged. For recaptures — fish possessing tags from previous years — length, sex, and tag number were recorded. All fish were processed at and returned to the location of capture, and condition (general health) of the fish was noted upon return to the water.



Not all captured legal-sized striped bass were tagged. Some — either from sea lion attack or the gear itself — were found dead. These fish were recorded as “dead” and were added to the total catch. Fish in poor condition were not tagged. These fish were released, recorded as “over”, and added to the total catch. Sometimes it was necessary to return fish without a tag because too many fish were captured to safely complete processing. These fish were recorded as “creeled”² and added to the total catch. Some legal and sub-legal sized fish were collected for a Pelagic Organism Decline (POD) analysis of bioenergetics. Legal-sized fish used for such analysis were recorded as “over” and added to the total catch; sub-legal sized fish were enumerated as stated above.

Minimal incidental take of listed Chinook salmon and steelhead occurred. Lengths of these fish were estimated to expedite processing and minimize handling stress. Fish condition and

¹ Equates to legal size of greater than or equal to 18 inches total length

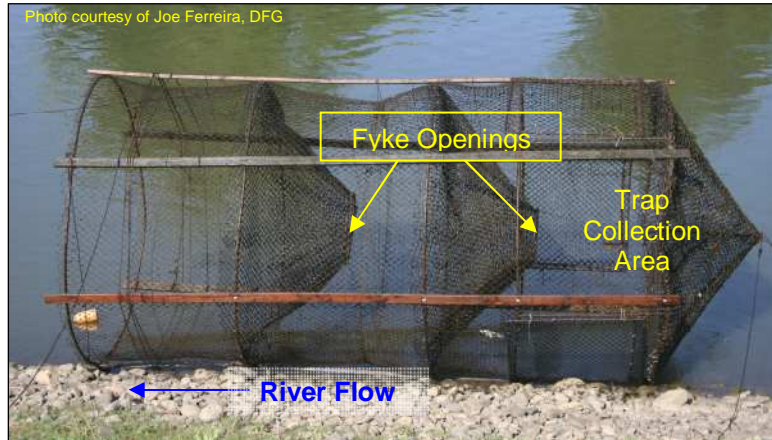
² Enumerated, measured, and sexed but not tagged

coloration, as well as the presence or absence of an adipose fin (steelhead only), were noted.

Fyke Traps

Ten cylindrical fyke traps (length 20'; diameter 10') were fished in the Sacramento River near Knights Landing (see photo below of a fyke trap). Five traps were placed on the east riverbank about two miles upstream of the Knights Landing Bridge (Highway 113). The remaining five traps were placed on the east riverbank about one mile downstream of the Knights Landing Bridge. Traps were placed approximately 50 – 150 feet apart from each other.

Traps were completely or near-completely submerged while fishing (collecting fish). Striped bass swam through the two openings (marked in photo above) and collected in the front (cone) of the trap.



To remove fish from a trap, the trap was rolled up the riverbank until one of the doors was positioned in such a way as to facilitate easy access for tending the trap from the ~20-foot pontoon boat, the *Kayot*, while ensuring the trap remained in enough water to minimize fish stress. A winch was used to roll the traps up and down the riverbank. A cable-and-block system was used once when the winch failed and a backup winch was not immediately available. When the trap and boat were in position, fish were netted from the trap and tagged on board the *Kayot* (see photo at right of crew processing fish).



The crew typically included one Fish and Wildlife Technician, two Scientific Aides, and a Biologist or Associate Biologist. Occasionally, a Scientific Aide substituted for the Biologist/Associate Biologist. A volunteer also was sometimes part of the crew.

Field days were Monday-Friday and tagging occurred Tuesday-Friday. To comply with requirements of the National Marine Fisheries Service, each trap was to be fished no more than one day. Field days began at 0730 and ended at 1500 or earlier, and varied depending on the number of fish caught and/or the number of available personnel.

Gill Nets

Department of Fish and Game (DFG) research vessels — *New Alosa* and *Striper II* (see photo at right of *Striper II* underway just below Antioch Bridge) — operated one gill net each. Both vessels were berthed at New Bridgehead Marina in Antioch. Field sampling occurred at two locations within the Sacramento-San Joaquin Delta: 1) Schad Landing on the San Joaquin River, upriver from the Antioch Bridge on the southeast side of Sherman Island and 2) Towers³ on the Sacramento River, on the northwest side of Sherman Island downriver of Horseshoe Bend (Figure 1).



Dimensions were the same for both gill nets: length = 100 fathoms, depth = 21 feet, mesh size = sections of 4, 4.5, 5, and 5.5 inches. The entire net was deployed from the vessel's stern. The net was retrieved onto a drum roller (spool), which was powered by hydraulics (see photo below/left of crew retrieving net). Net

design⁴ reduced the chance of fish mortality. A float line maintained buoyancy and allowed the net to drift with the current.



Three crew members (boat operator and two taggers⁵) worked onboard the *Striper II*. Four crew members (boat operator, deckhand, and two taggers) worked onboard the *New Alosa*. When a dedicated deckhand was not available, one of the taggers would perform deckhand duties. Both crews met at New Bridgehead Marina at approximately 0700 hours. The vessels left the marina at approximately 0730 hours.

Gill netting was conducted either 3 or 4 days a week (Monday – Thursday or Monday – Wednesday). On a typical day, the net was deployed 7 – 9 times between 0800 to 1400 hours. Net retrieval began about 20 minutes after complete deployment. Total fishing time (drift time) varied depending upon the number of fish in the net. Striped bass and non-salmonids were removed

from the net onboard the vessel. When necessary, fish were kept in tubs of water prior to tagging. Salmonids were shaken from the net rather than brought on board, so as to minimize stress. As a result, lengths were estimated for these fish.

³ Code name for that area of the Sacramento River

⁴ Gill nets were constructed with stringers that created shallow pockets where fish might be encased rather than gilled (excerpted from Cruise Report June 29, 2005)

⁵ One who tags the fish — could be a Biologist, Scientific Aide, or Technician

Figure 1. Map of gill net sampling locations



Results

Overall

Fyke trap and gill net fishing efforts caught a combined 2,585 legal-sized striped bass. Of these, 2,336⁶ were then tagged (Table 1, sum of 279, 814, and 1,243). Additionally, collective efforts landed 660 sub-legal sized striped bass. Ten fish of the total legal-sized caught were fish tagged in previous seasons.

Table 1. Summary of gill netting and fyke trapping efforts of the 2009 season

	Total Legal Caught			Total Legal Tagged			Sub-legal			Minutes/# Traps Fished			Days Fished		
	New Alosa	Striper	Fyke Traps	New Alosa	Striper	Fyke Traps	New Alosa	Striper	Fyke Traps	New Alosa	Striper	Fyke Traps	New Alosa	Striper	Fyke Traps
Total	294	989	1,302	279	814	1,243	64	68	528	1,664	4,940	266	7	19	29
Daily Minimum	10	10	0	9	8	0	1	0	0	103	132	5	N/A	N/A	N/A
Daily Maximum	105	184	181	105	94	174	21	15	64	329	330	10	N/A	N/A	N/A
Daily Average	42	52	45	40	43	43	9	3	18	238	260	9	N/A	N/A	N/A
Minimum/Day/Drift or Trap	0	0	0	0	0	0	N/A	N/A	N/A	21	17	N/A	N/A	N/A	N/A
Maximum/Day/Drift or Trap	48	180	91	48	51	89	N/A	N/A	N/A	71	107	N/A	N/A	N/A	N/A
Average/Day/Drift or Trap	6.7	7.3	4.9	6.3	6.0	4.7	N/A	N/A	N/A	38	36	N/A	N/A	N/A	N/A

Of the fish that were tagged and for which a length measurement was recorded (N = 2,325), length ranged from 42 – 109 cm FL and averaged 53 cm FL. Males were more abundant than females. Of the fish that were tagged and for which sex was recorded (N = 2,324), 2,105 were male and 219 were female (~10 males to 1 female). On average, females were larger in length (♀ = 66 cm FL, ♂ = 52 cm FL).

⁶ Fifty-three percent of 2008 (N = 4,401) and the lowest to date (previous low in 1983, N = 3,094)

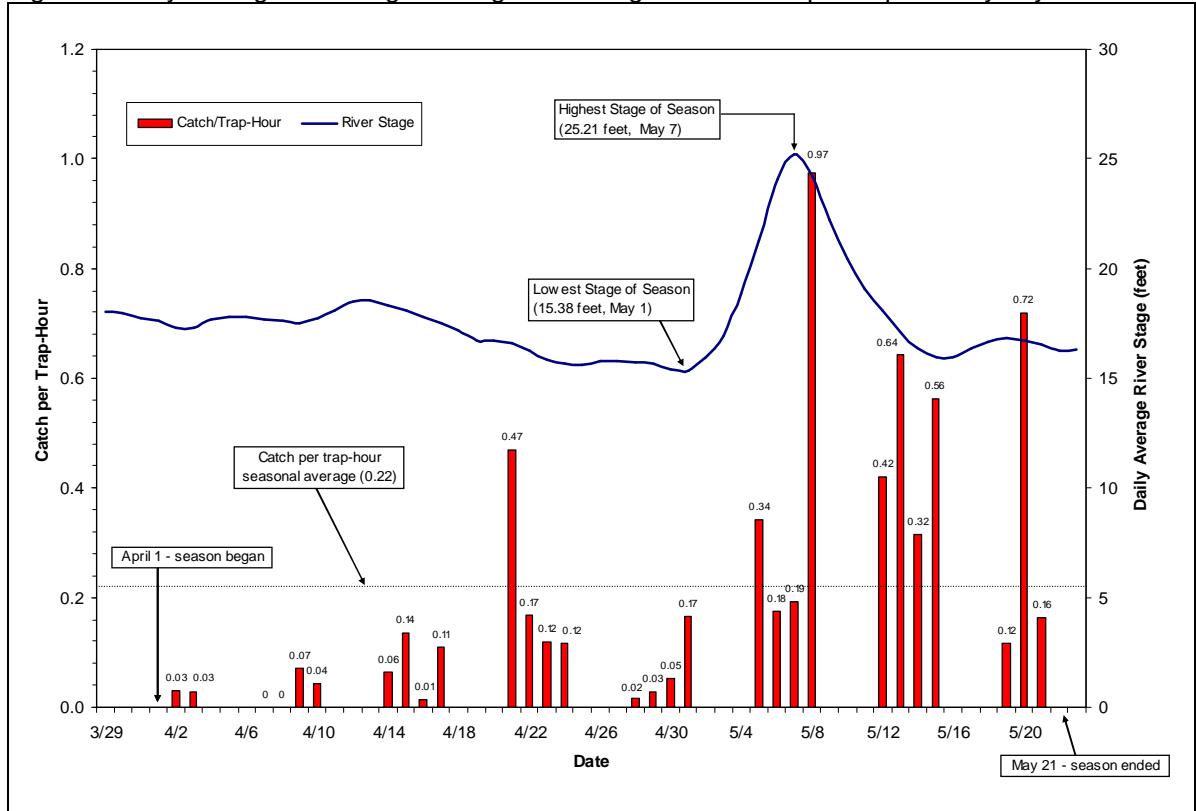
Fyke Traps

Fyke traps were deployed 29 days and tended 266 times⁷ (Table 1). The total number of legal-sized striped bass caught was 1,302⁸, of which 1,243 were then tagged (Table 1). Eight of the 1,302 caught were recaptures from previous tagging seasons (years 2007 and 2008). Fifty-one of the 1,302 caught were recorded as “over” — released alive or used for POD analysis of bioenergetics. The total number of sub-legal (< 42 cm FL) fish was 528 (Table 1).

Traps were checked daily. The amount of time each trap fished depended upon the time the trap was set and the time the trap was pulled (to check for fish) the following day. On average, traps fished 23.5 hours per day (range: 16.0 – 28.5 hours).

Legal-sized striped bass catch per trap-hour⁹ by day was calculated and plotted against river stage (Figure 2) and water temperature (Figure 3). Average catch per trap-hour for the tagging season was 0.22 fish. In April, only one day (April 21) was above this average. In May, seven days were above this average (Figures 1 and 2). On May 8, catch per trap-hour was near 1.0, the highest for the season.

Figure 2. Daily average river stage at Knights Landing versus catch per trap-hour by day

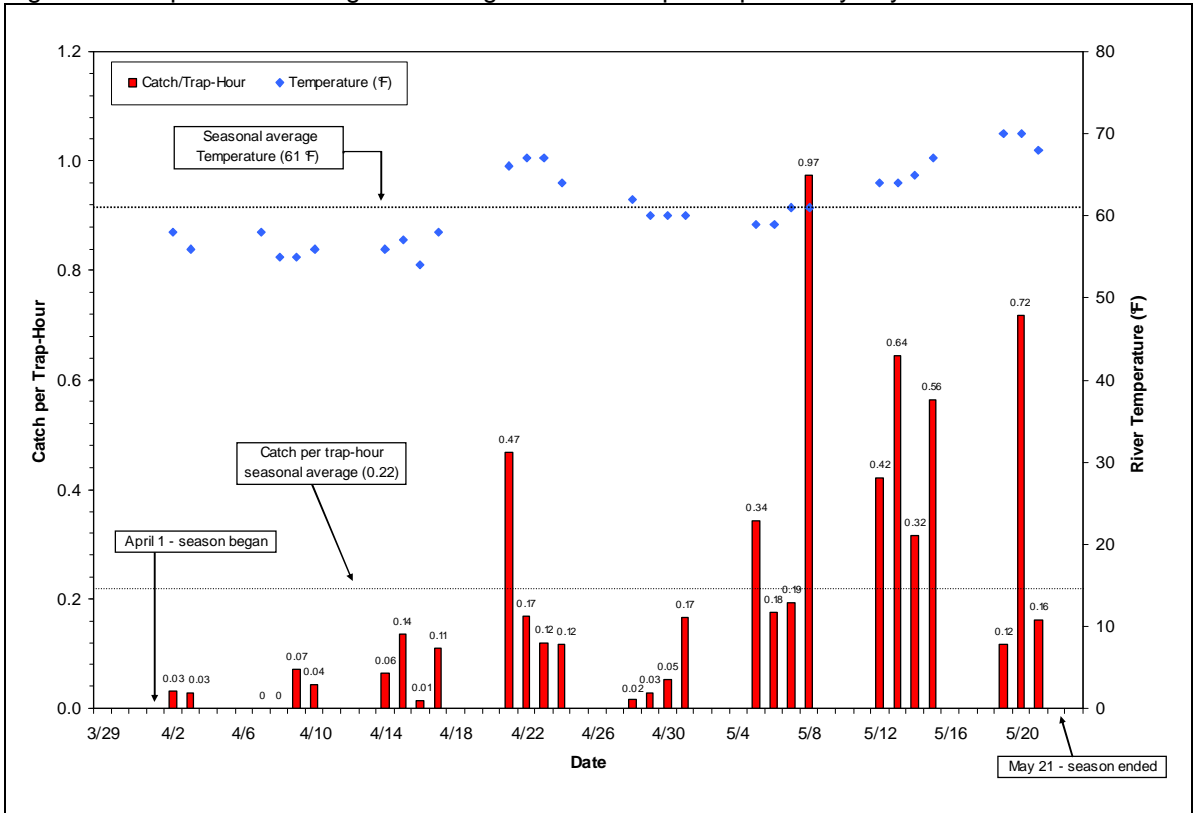


⁷ Twenty more times than in 2008 (tended 246 times)

⁸ Fifty percent of 2008 (N = 2,630)

⁹ Rounded to nearest ¼-hour and cumulative for the number of traps fishing (for example, if 10 traps each fished 24 hours in one day, then trap-hours for that day equaled 240.)

Figure 3. Temperature at Knights Landing versus catch per trap-hour by day



Daily average river stage for the Knights Landing-portion of the Sacramento River was calculated from hourly readings posted on-line at the California Data Exchange Center's website. Within one week, river stage went from the lowest of the season to the highest of the season (Figure 2). Water temperature was recorded by field crew at the beginning of each tagging day (Figure 3). Average water temperature was 61 degrees Fahrenheit (°F) for the tagging season.

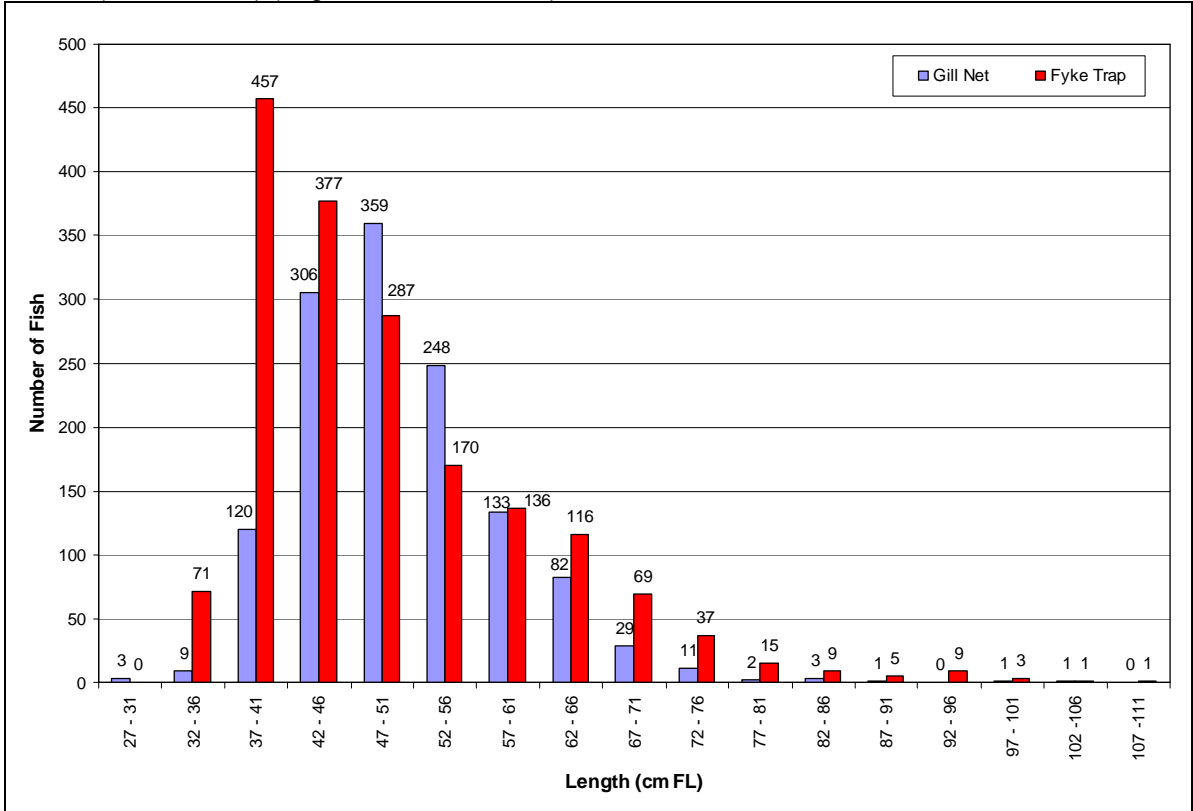
The majority of fish were tagged during the final three weeks of the season (Table 2). Prior to Week 6, only Week 4 yielded noteworthy numbers. Average fork length of fish that were tagged remained fairly consistent from week to week. Males were more abundant than females. Of the fish that were tagged and for which sex was recorded, 1,146 were male and 97 were female (~12 males to 1 female). Sub-legal sized fish accounted for approximately 30% of the total striped bass catch (total catch = 1,302 legal-sized + 528 sub-legal sized, Table 1).

Table 2. Weekly fyke trap totals

Week	1	2	3	4	5	6	7	8
Number of Fish Tagged	9	27	74	200	47	252	395	239
Number of Traps Tended	13	40	40	40	39	29	36	29
Number of Days Fished	2	4	4	4	4	4	4	3
Average FL (cm)	50	48	52	55	56	54	53	54
Maximum FL (cm)	60	59	97	93	90	96	109	102

Most striped bass ranged from 32 to 71 cm FL (Figure 4). This range was slightly broader than observed for gill net (Figure 4). Length range broadened slightly around Week 4 (Appendix 2). Fish greater than or equal to 90 cm FL were caught Weeks 3 through 8 (Appendix 2). Four fish were ≥ 100 cm FL (maximum = 109 cm FL).

Figure 4. Length frequency of all striped bass collected in fyke traps and gill nets during the season (Weeks 1 – 8) (Legal-size: ≥ 42 cm FL)



Gill Nets

The *New Alosa* fished on 7 days (1,664 minutes¹⁰ drift time) and the *Striper II* fished on 19 days (4,940 minutes drift time) (Table 1). The *Striper II* caught 989 legal-sized striped bass, of which 814 were then tagged. The *New Alosa* caught 294 legal-sized striped bass, of which 279 were then tagged. The *Striper II* had a higher daily average catch than the *New Alosa* (Table 1). Catch per hour (of drift time) was slightly higher for the *Striper II* than the *New Alosa*, 12.0 versus 10.6. Both vessels each caught approximately the same number of sub-legal striped bass for the season.

Total legal-sized catch for both vessels combined was 1,283. Of these fish, 1,093 were then tagged. Combined for both vessels, 86 legal-sized fish were “creeled”, 64 legal-sized fish were recorded as “over” — released alive or used for POD analysis of bioenergetics, 38 legal-sized fish were observed and recorded as dead¹¹, and two fish were recaptures from previous tagging years (years 2007 and 2008). Total sub-legal catch combined for both vessels was 132, which was far fewer than the fyke trapping total (Table 1).

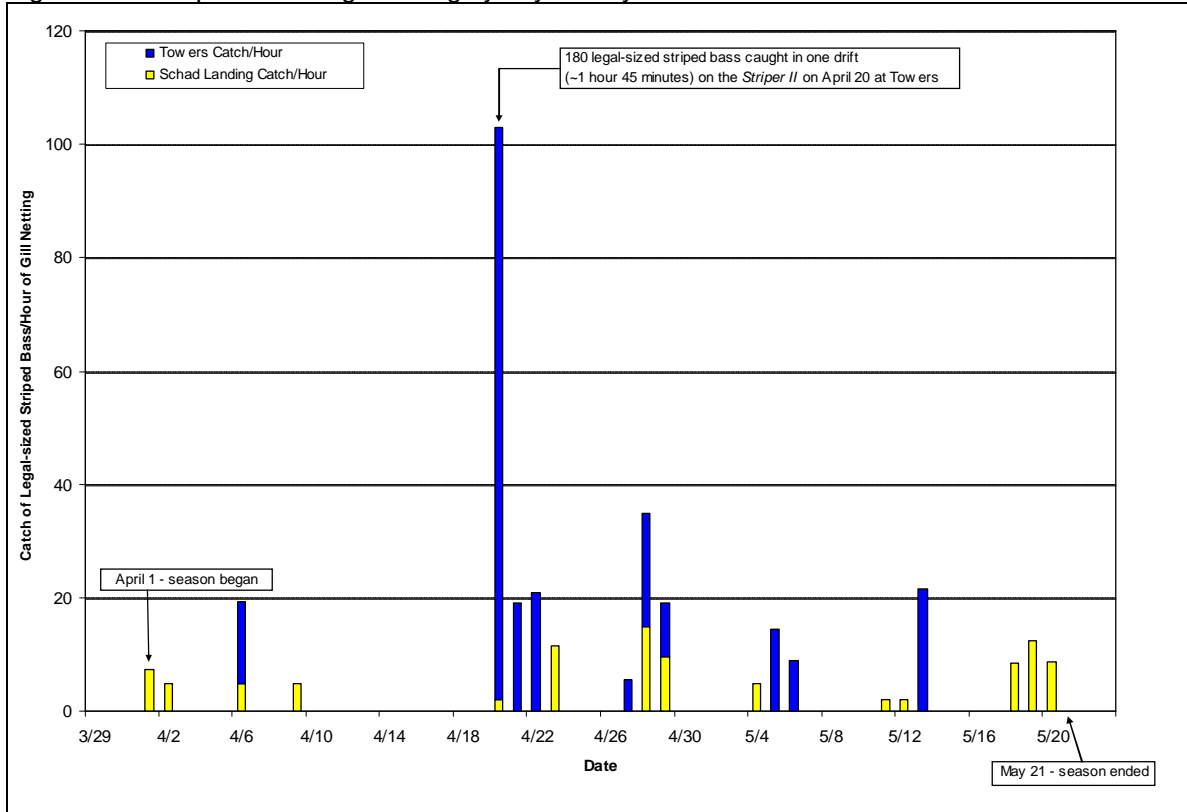
Schad Landing was fished 14 days and Towers was fished 10 days (Figure 5). Catch of legal-sized striped bass per hour (of drift time) was greater at Towers than Schad Landing (Figure 5).

¹⁰ About 44% of 2008 effort (3,812 minutes); *New Alosa* was needed for smelt-centric surveys

¹¹ Most of which were used for the POD analysis of bioenergetics

Average catch per hour at Schad Landing was 7.1. Average catch per hour at Towers was 23.5. During one drift at Towers, 180 legal-sized striped bass were caught in about one hour and forty-five minutes¹². Excluding this one drift, average catch per hour (value = 14.9) at Towers was still greater than at Schad Landing.

Figure 5. Catch per hour for gill netting by day and by location



The greatest number of fish tagged in a single week and greatest catch per hour was in Week 4 (Table 3), when almost 16 fish were tagged for every hour of fishing. Weekly average length of fish did not vary much and ranged from 50 – 55 cm FL. Of the fish that were sexed, 959 were males and 122 were females (about an 8 to 1 male to female ratio). Sub-legal sized fish accounted for approximately 9% of the catch (total catch = 1,283 legal-sized + 132 sub-legal sized, Table 1).

¹² Long drift time was due to the large number of fish; it took the 3-person crew a while to process 180 fish and the net was still fishing while the crew was processing.

Table 3. Weekly gill net totals

Week	1	2	3	4	5	6	7	8
Number of Fish Tagged	73	96	N/A	293	289	110	112	120
Minutes Fished	719	777	N/A	1,103	1,546	815	873	771
Number of Days Fished <i>(New Alosa)</i>	2	1	N/A	1	3	0	0	0
Number of Days Fished <i>(Striper II)</i>	2	2	N/A	4	2	3	3	3
Average FL (cm)	50	52	N/A	51	51	52	53	55
Maximum FL (cm)	70	85	N/A	100	82	88	74	105

The size of most striped bass ranged from 37 to 66 cm FL (Figure 4). Length range did not vary appreciably week to week (Appendix 3). Of the fish that were measured, only 19 were ≥ 72 cm FL and only two of these were ≥ 100 cm FL (maximum = 105 cm FL).

By-catch

Salmonid by-catch for the tagging season (fyke traps and gill net combined) was three Chinook salmon and one steelhead (Table 4). All three salmon were reported as good-to-excellent condition with bright coloration (guesstimated lengths = 54, 61, and 74 cm). The steelhead was dead and its adipose fin was present (guesstimated length = 62 cm).

Non-salmonid by-catch also was noted (Table 4). Three white sturgeon were caught in the fyke traps (guesstimated lengths = 122, 132, and 144 cm). Note: by-catch was not tallied (or checked) as closely for gill netting operations, and the crew approximated American shad catch to be over 100.

Table 4. By-catch of the 2009 striped bass tagging season

Other Species (common name)	Scientific Name	Fyke Trap	Gill Net	Total
American Shad	<i>Alosa sapidissima</i>	801	1	802
Bluegill	<i>Lepomis macrochirus</i>	1	0	1
Carp	<i>Cyprinus carpio</i>	5	0	5
Channel Catfish	<i>Ictalurus punctatus</i>	52	0	52
Chinook Salmon	<i>Oncorhynchus tshawytscha</i>	2	1	3
Largemouth Bass	<i>Micropterus salmoides</i>	0	1	1
Sacramento Blackfish	<i>Orthodon microlepidotus</i>	1	0	1
Sacramento Pikeminnow	<i>Ptychocheilus grandis</i>	3	0	3
Sacramento Sucker	<i>Catostomus occidentalis</i>	3	0	3
Starry Flounder	<i>Platichthys stellatus</i>	0	1	1
Steelhead	<i>Oncorhynchus mykiss</i>	0	1	1
White Sturgeon	<i>Acipenser transmontanus</i>	3	0	3

Discussion

The number of adult striped bass tagged this season (N = 2,336) was the fewest since the tagging program started in 1969. Despite similar effort, total catch was almost half of that in 2008 (N = 2,585 versus N = 4,872). Total catch for both gear types was poor (< 100 fish/week) until Week 4. Greater catch in Week 4 and Weeks 6 – 8 for fyke traps might have been attributable to increased water temperatures and increased river stage/flows.

Some problems that affected fishing this season were as follows:

- Sometimes windy conditions — especially north winds — made it difficult to fish the gill net well. On May 4, the *Striper II* deployed only half the net (50 fathoms) for three out of the nine drifts completed that day due to high winds and surf.
- Towers was a good area to catch fish using gill nets, but high winds made it difficult to travel to and/or fish this area of the river.
- On April 2 at Schad Landing, a private vessel ran over the net of the *Striper II*. The net sustained damage and the crew had to return to port in order to repair the net.
- Sea lions picked fish out of nets on 12 of 20 days.
- Runoff from rain increased flows in the Sacramento River at Knights Landing in early May. These high flows and large debris moving downriver knocked some traps out of position. It was several days (~ 3) before the flows subsided and the traps could be repositioned to continue fishing.
- Support boards on trap 8 broke and the trap could not fish until these boards were replaced (did not fish for eight days).
- On May 19, the field crew observed that three traps had been pulled almost completely out of the water by vandals and were not fishing optimally.
- In 2008, at least one sea lion raided a fyke trap and one sea lion died in a fyke trap. In an effort to protect sea lions, “sea lion-exclusion bars” were installed on every trap prior to the start of the season (see photo at right). Because no sea lions were observed by the fyke trap crew during most of April and the bars might affect fishing, the bars on traps 2, 4, 7, 8, and 10 were removed April 30.

Summary of Recommended Changes

- Request permission from National Marine Fisheries Service to soak fyke traps more than one day.
- Develop a more efficient and effective way to record by-catch from gill nets and to record sea lion/seal encounters.
- Understand the effect of the sea lion-exclusion bars and modify the design as appropriate.



Acknowledgements

We would like to recognize and give a very special thanks to our friends at *StingRayz Beach Boardwalk and Marina* in Knights Landing. We are grateful for their hospitality and generosity and thank them for allowing us to berth our boat (the *Kayot*) at their marina.

We would like to thank the kind folks at the Woodland Caltrans station for allowing us to house our vehicle in their secure yard.

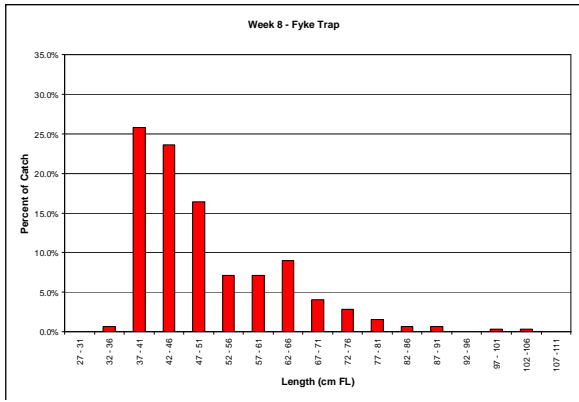
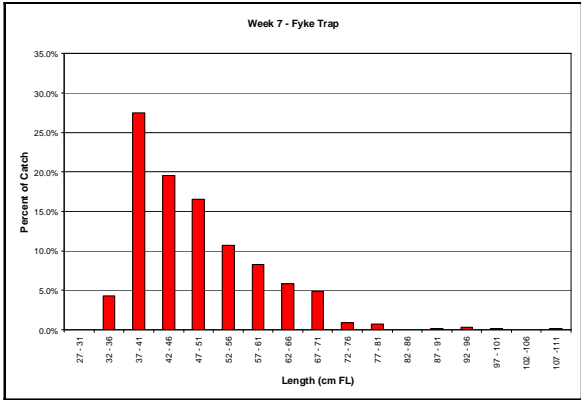
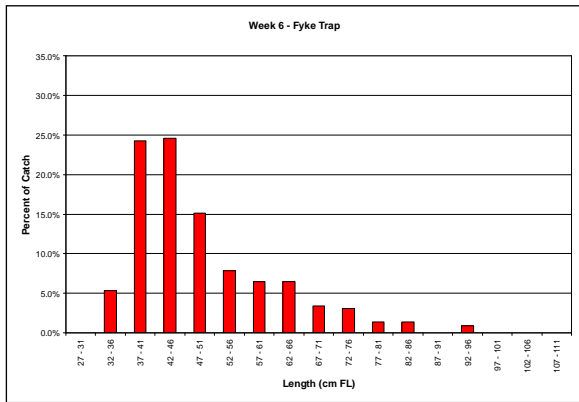
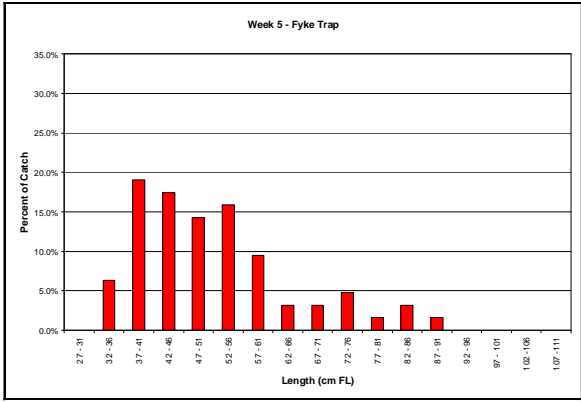
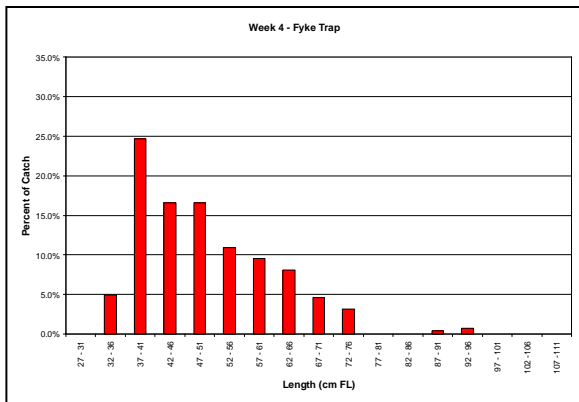
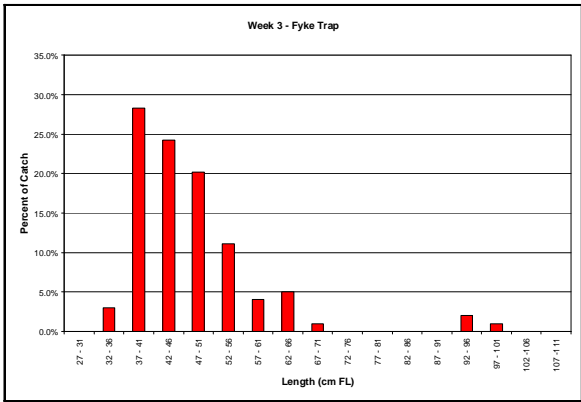
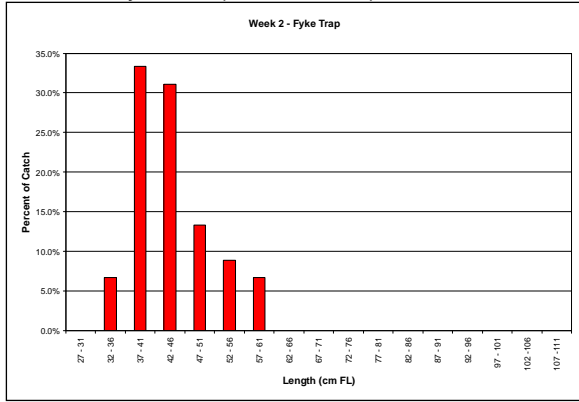
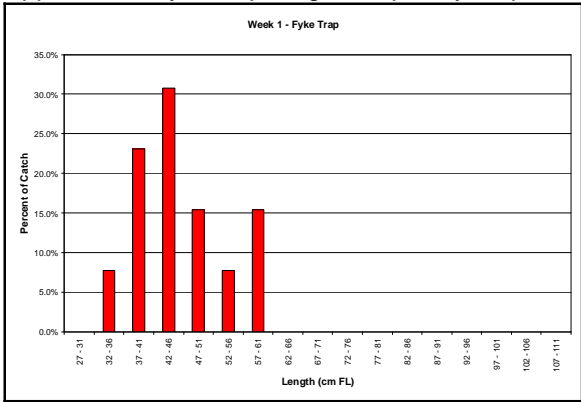
We would like to thank Mr. Jack Bailey (Reclamation District 1500) for his efforts in presenting to the trustees of Reclamation District 1500 and to local landowners our request for access to the Sacramento River through various properties. His efforts allowed us to begin our fieldwork in a timely manner.

Last but not least...we would like to thank all personnel involved in this project. Their commitment and hard work ensured the collection of sound scientific data.

Appendix 1. Personnel list. All, except Phil Voong (US Fish and Wildlife Service) and Scott Rutledge (volunteer), were employees of the California Department of Fish and Game (Bay-Delta Region, 4001 N. Wilson Way, Stockton, CA 95205)

Name	Position Title	Fyke Trap (FT) Gill Net (GN) Both (B)
Amber Aguilera	Scientific Aide	FT
Bill Beckett	Scientific Aide	B
Dustin Dinh	Scientific Aide	GN
Jason DuBois	Biologist	B
Ken Flowers	Mate - <i>Striper II</i>	GN
Mike Harris	Associate Biologist	Lab/FT
Dave Hull	Fish and Wildlife Technician	FT
Carlie Jackson	Scientific Aide	B
Tim Matt	Scientific Aide	B
Ryan Mayfield	Associate Biologist	GN
Jerry Morinaka	Associate Biologist	FT
Cole Paris	Scientific Aide	FT
Garrett Peterson	Scientific Aide	FT
Melissa Riley	Scientific Aide	B
Scott Rutledge	Volunteer	FT
Mike Silva	Mate - <i>New Alosa</i>	GN
Steve Slater	Associate Biologist	FT
Katie Smith	Scientific Aide	FT
Phil Voong	Biological Technician - USFWS	B

Appendix 2. Fyke trap length frequency as percent of catch by week (Weeks 1 - 8)



Appendix 3. Gill net length frequency as percent of catch by week (Weeks 1 - 8)

