

Fisheries Sampling in the Lower Salt River during the Fall and Winter of 2014 – 2015

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for
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Introduction

The Salt River is a tidally influenced slough tributary to the Eel River estuary located in Humboldt County near Ferndale, California. Salinity in the Salt River varies with the interactions of tides, Eel River flows, and freshwater inflows from its tributaries (Williams, Francis, and Reas creeks). In the mid-1800s the Salt River channel was sufficiently deep to support ship traffic up to Port Kenyon, however increased sediment delivered from the upper watershed and reduced tidal prism to flush sediment resulted in an aggraded channel with significantly reduced widths and depths. The frequency of flooding in Ferndale and the surrounding farmland progressively increased as the Salt River filled with sediment over the past century, and efforts to alleviate flooding have become a persistent issue. An intensive multi-stakeholder planning process was started in 1990 with a Coastal Conservancy grant that initiated studies on sedimentation, hydrology, and aquatic and avian biology. Stakeholders have included Ferndale residents and dairy farmers, as well as tribal, city, county, state, and federal entities. The culmination of this process was a multi-phase plan to restore the hydraulic and ecological function of the Salt River.

Near the Salt River mouth, the 420 acre Riverside Ranch was purchased from an interested seller and the title is now held by the California Department of Fish and Wildlife (CDFW). Phase 1 of the Salt River Restoration Program was focused on Riverside Ranch parcel. In 2013, the Salt River Channel was expanded and deepened, selected levees around Riverside Ranch were lowered, a tide gate was removed, and interior slough channels were excavated to meet the following objectives: 1) increase hydrologic function to the lower 2.5 miles of the Salt River, 2) provide access for re-colonization of the lower Salt River by native fish species, and 3) improve habitat for waterfowl and other avian species. The interchange of flow between the Eel River estuary and the lower Salt River was restored in October of 2013 following completion of Phase 1 excavation and other construction activities.

During the spring of 2014, fish sampling was conducted in the lower Salt River by CDFW, the Humboldt County RCD and other partners to monitor the presence and distribution of fish within the recently restored main channel and sloughs located on the Riverside Ranch. This sampling captured fish with seine nets and minnow traps at 11 established sites distributed throughout the main channel and slough networks (Figure 1). All of the spring sampling was conducted at low tide when water was concentrated in the channels. These initial sampling efforts documented numerous fish species utilizing the newly accessible habitat, including ESA-listed species such as coho salmon (*Oncorhynchus kisutch*), tidewater goby (*Eucyclogobius newberryi*), and Chinook salmon (*O. tshawytscha*).

The next phase of fish sampling occurred during the fall and winter of 2014-2015 and NOAA Fisheries requested that both low and high tide sampling were conducted. Ross Taylor and Associates (RTA) started this sampling effort in November of 2014 and sampled monthly through March of 2015. RTA conducted low tide sampling at the 11 sites established by CDFW, using methods consistent with those utilized by CDFW. RTA was also tasked with developing a high tide sampling protocol for the project. This protocol was drafted after two rounds of high tide sampling were conducted by RTA in November and December of 2014, in which various techniques were tried and the 11 established sites were assessed for feasibility.

This remainder of this report includes the following sections:

1. Methods used for low tide and high tide sampling.
2. Descriptions of the sites sampled at low and high tides.
3. Results from the monthly sampling conducted between November 2014 and March 2015.
4. A photographic catalog of the sample sites and fish species captured.

Low Tide Sampling Methods

At low tide, all 11 previously established sites were sampled (Figure 1). These sites were selected to encompass the diversity of channel sizes, depths and locations throughout the main Salt River channel, the northern slough (N1), the southern slough (S1), and smaller side channels to the two sloughs (Figure 1). Photographs of these sites are presented in Appendix A.

RTA used two seine nets to conduct the low tide sampling: a 20-foot long x 4-foot tall net with a 1/8-inch mesh and a 30-foot long x 4-foot tall net with a 1/8-inch mesh. Both nets were attached to six-foot long poles. We experimented with a seine net with a 1/16-inch mesh and found this net too cumbersome because it caught too much detrital matter. At each site, we made a single pass in the manner described in previous CDFW reports; typically a 150-foot reach was seined at each location. Unless the tide was completely slack, we always seined against the current to maintain a bag in the seine to more effectively capture and hold fish. Prior to seining each site we recorded the start time, salinity, dissolved oxygen, and water temperature. All captured fish were temporarily held in aerated 5-gallon buckets, identified to species, enumerated, and released back into the waterway. Photographs were taken of select fish for the development of a Salt River species catalog (Appendix B). Once the sampling was completed, an end time was recorded. All sampling data were recorded in a bound, waterproof field notebook. Back in the office, data were entered into an Excel spreadsheet. Photographs were downloaded, edited, and captioned (species, location and date).



Figure 1. Aerial photograph of lower Salt River and fish monitoring sites.

High Tide Sampling at Main Channel Sites

At high tide, increased water depths and channel widths in the Salt River's main channel dictated using different sampling gear than wading with the 30 foot seine net. A kayak was used to set a 100-foot long seine net that was six feet tall and had ¼-inch mesh. On each end, the 100-foot net had approximately 10 feet of additional line, allowing for a 120-foot set. The stern end of the kayak was modified to hold a 100-quart cooler that had one end removed, in which the 100-foot seine net was carefully stacked (Figure 2).



Figure 2. Kayak with cooler holding the 100-foot seine net for high tide sampling on 12/02/14.

To set the 100-foot net with the kayak, the following steps were followed by the two-person sampling crew:

1. The terminal ends of the cork and lead lines were clipped to the stern of the kayak with a carabineer and the leading ends of the seine net lines were held to the river bank by a four-foot length of rebar that was securely staked to the bank. The rebar was located approximately 10 feet from the water's edge so that the leading edge of the net was just out of the water.
2. The 100-foot seine net was carefully stacked in the cooler, accordion-style, with cork and lead lines separated to minimize tangling and wrapping.
3. The kayaker wore a life jacket and chest waders with a snugly clipped waist belt.
4. The kayaker paddled the kayak in a large semi-circle from the rebar stake to a predetermined location; either upstream or downstream from the starting location (prevailing wind and tide movement dictated direction) (Figure 3).

5. The shore-based crew member monitored the net-set and informed the kayaker if the net was setting correctly or needed adjustment – the kayaker occasionally had to grab the cork line and give it a firm yank to avoid tangles or wrapping of the lead line.
6. Once the kayaker completed the net-set, the shore-based crew member grabbed the bow handle of the kayak and then both crew members dragged the boat ashore until the net was at the river bank (Figure 4). The terminal ends of the cork and lead lines were then unclipped from the kayak.
7. Both crew members then started pulling in the net at the end just unclipped from the kayak, one person on the cork line and one person on the lead line, working in such a manner to keep the cork line from drifting over the top of the lead line. The person handling the lead line kept this line as low as possible to minimize lifting the lead line off the channel bottom.
8. Once approximately 60 feet of the net had been retrieved, one crew member switched ends and started to pull in the net from the opposite side. Again, making sure the lead line was kept low was crucial.
9. Once the entire net was pulled, the two crew members carefully maneuvered the net so that all captured fish were centralized in a small pocket. Then one crew member used an aquarium net to collect fish and place them in aerated five-gallon buckets.
10. After the sampled fish were processed, the 100-foot seine net was restacked into the cooler, making sure all sticks and other debris were removed.



Figure 3. Setting the 100-foot seine net at Site #10 on March 23, 2015.



Figure 4. Completing the set of the 100-foot seine net at Site #10 on March 23, 2015.

Initially, the 100-foot seine net was used for high tide sampling at all four main channel sites, #1, #10, #18 and #19 (Figure 1). Due to the steepness of the banks at sites #18 and #19, it was very difficult to maintain contact of the lead line with the river bottom. Subsequently, very few fish were captured at these locations and both sites were removed from the high tide sampling regime. Because a single semi-circular set of the 100-foot net provided less coverage than pulling a handheld seine net at low tide, we experimented with setting the 100-foot seine net several times at each sampled main channel site (#1 and #10). After each set, the rebar was repositioned up or down the river bank so each subsequent set covered new water. High tide sets with the 100-foot seine net were most productive at slack-water.

In January, two additional high tide main channel sampling sites were established near Site #1 that had gradually-sloping banks (Figure 5). Site #1-A was located near the Riverside Ranch barn, downstream of Site #1. Site #1-B was located upstream of Site #1, approximately 200 feet downstream of the Reas Creek confluence with the Salt River. At both #1-A and #1-B, we made two to three net sets each time we sampled these new locations.

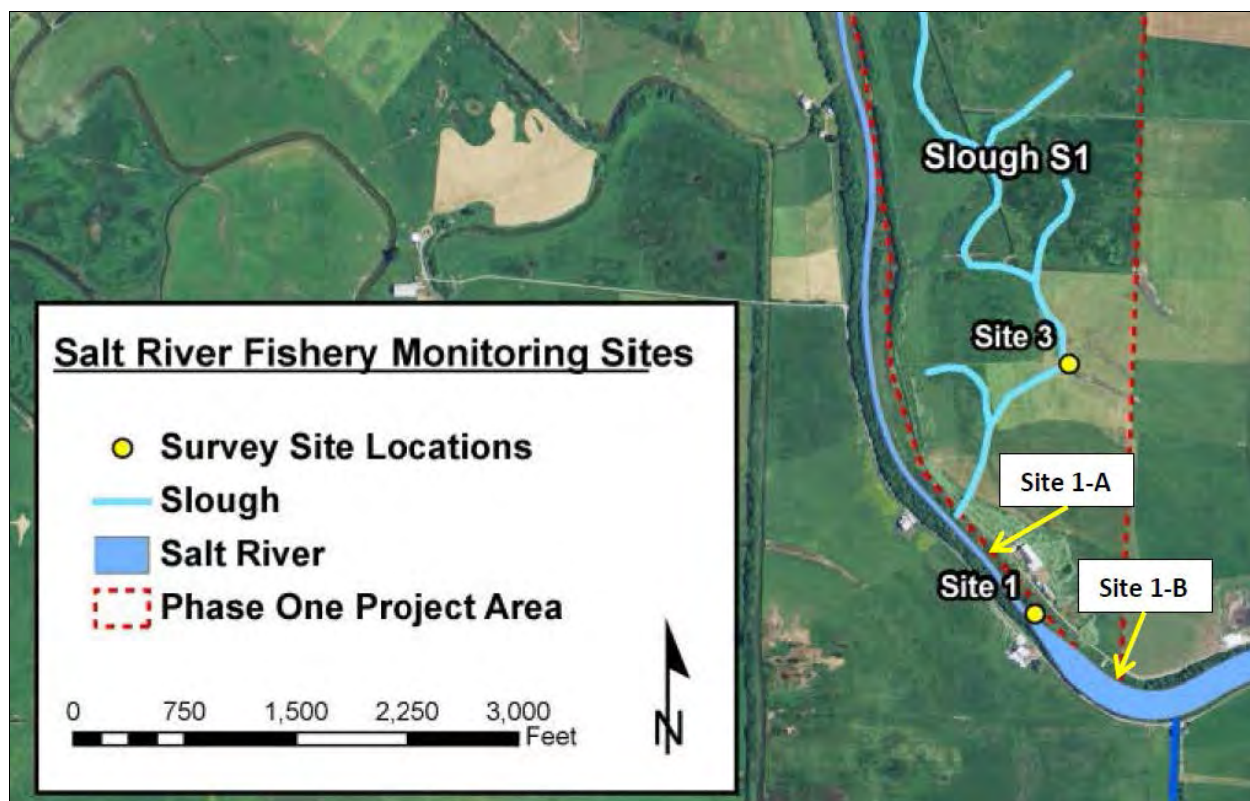


Figure 5. Salt River map showing locations of additional high tide sampling sites, #1-A and #1-B.

High Tide Sampling at Slough and Side Channel Sites

The sloughs and side channels presented sampling challenges at high tide too. At most sites, water depths were typically too deep to safely wade with chest waders. The feasible sites we could sample were side channels with a terminal end where the seine net could be walked down from the top along the bank edges. RTA employed a 30-foot long seine net with a 1/8-inch mesh which was required to span the width of several wider side channels. The sites feasibly sampled were #3 (drainage ditch only), #8, #9 and #14 (Figure 1). Sites #7, #15 and #17 were too deep to safely wade but were too narrow to effectively maneuver the kayak within them to set and retrieve the 100-foot seine net (Figure 1).

Salt River Fisheries Monitoring Site Descriptions (Figures 1 and 5)

1. Site #1 is located on the Salt River main channel near the Riverside Ranch barn and a utility pole adjacent to the main road. Approximately 150 feet of channel upstream of the utility pole was sampled at low and high tides.
2. Site #3 is located at the confluence of the Southern Slough and a left-bank tide gated drainage ditch. Both the slough channel and the drainage ditch were sampled at low tide. Only the drainage ditch was sampled at high tide.
3. Site #7 is associated with a piece of LWD in the Southern Slough, in the upper end of the slough. Approximately 100 feet of channel on both sides of the LWD was sampled at low tide.
4. Site #8 is located on a branch of the upper Southern Slough and is associated with a goby lift. The channel was sampled from the goby lift up to its terminal end at both low and high tides.
5. Site #9 is associated with a goby lift on a branch of the Southern Slough, at the upper end of the slough. The channel was sampled from the goby lift up to its terminal end at both low and high tides..
6. Site #10 is located on the Salt River between the Southern and Northern slough confluences with the main channel. Approximately 150 feet of channel was sampled at both low and high tides.
7. Site #14 is on a branch of the Northern Slough that has a terminal end. Approximately 150 feet of the channel was sampled up to the terminal end at low and high tides.
8. Site #15 is located on the Northern Slough's main channel, just upstream of the second branch off of the slough. Approximately 150 feet of channel was sampled at low tide, upstream of the second slough channel branch.
9. Site #17 is associated with a piece of LWD in the upper reach of the Northern Slough's main channel. Approximately 100 feet of channel on both sides of the LWD was sampled at low tide.
10. Site #18 is on the Salt River's main channel, approximately 300 feet upstream of the confluence with Cutoff Slough. Approximately 150 feet of channel was sampled at low tide.
11. Site #19 is located on the Salt River, just upstream of the Northern Slough confluence. Approximately 150 feet of channel was sampled at low tide, upstream of the confluence.
12. Site #1-A is located Salt River main channel, downstream of Site #1 near the downstream end of the Riverside Ranch barn. This site was sampled only at high tide. Up to three net sets were made with the kayak and 100-foot seine net.

13. Site #1-B is located Salt River main channel, upstream of Site #1 near the Reas Creek confluence. This site was sampled only at high tide. Up to three net sets were made with the kayak and 100-foot seine net.

Photographs of the Salt River fisheries sampling sites are located in Appendix A.

Fish Sampling Results – November 2014

In November, the sampling occurred on the 11th, 12th and 19th (Tables 1 and 2). On the 11th, the low tide (at Humboldt Bay North Spit) was a 3.24 ft at 08:11 hours. On the 12th, the low tide was a 3.41 ft at 09:07 hours. The high tide on the 12th was a 5.99 ft at 14:47 hours. On the 19th, the high tide was a 6.99 ft at 09:04 hours. On November 11th and 12th, the Eel River discharge at Scotia was approximately 300 cfs. On November 19th, the Eel River discharge at Scotia was approximately 360 cfs. The relatively low flows in the Eel River as well as in the Salt River and its tributaries resulted in salinity measurements between 19.70 and 28.00 parts per thousand (ppt)(Table 1).

Table 1. Dates, site numbers, start and end times, and water quality measurements for November 2014 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
11/11/2014	#1	Seine Net – 30 ft	Low	08:15	08:55	12.1	6.51	19.70
11/11/2014	#17	Seine Net – 20 ft	Low	09:30	09:55	11.1	4.06	25.17
11/11/2014	#18	Seine Net – 30 ft	Low	10:30	11:10	13.5	9.80	25.59
11/11/2014	#8	Seine Net – 20 ft	Low	11:45	12:40	12.8	4.50	23.75
11/12/2014	#3	Seine Net – 30 ft	Low	08:45	09:20	10.8	5.10	23.80
11/12/2014	#7	Seine Net – 20 ft	Low	09:35	09:58	10.4	4.30	23.70
11/12/2014	#10	Seine Net – 30 ft	Low	10:20	10:35	12.7	6.83	24.41
11/12/2014	#19	Seine Net – 30 ft	Low	10:55	11:25	12.3	7.93	24.72
11/12/2014	#14	Seine Net – 20 ft	Low	11:40	12:00	12.6	8.32	26.15
11/12/2014	#9	Seine Net – 20 ft	Low	12:05	12:22	12.4	8.33	23.69
11/12/2014	#8	Seine Net – 20 ft	High	14:55	15:25	14.1	6.00	23.90
11/12/2014	#10	Seine Net – 100 ft	High	15:30	15:55	13.6	7.21	28.00
11/12/2014	#1	Seine Net – 100 ft	High	16:05	16:30	13.2	N/A	23.90
11/19/2014	#18	Seine Net – 100 ft	High	09:30	10:15	13.7	9.02	23.82
11/19/2014	#19	Seine Net – 100 ft	High	11:00	11:20	13.7	8.90	23.81
11/19/2014	#1	Seine Net – 100 ft	High	11:55	12:20	12.8	8.45	22.60

Six fish species were captured during the November 2014 sampling: tidewater goby, threespine stickleback (*Gasterosteus aculeatus*), sculpin species (*Cottus sp.*), Pacific staghorn sculpin (*Leptocottus armatus*), surf smelt (*Hypomesus pretiosus*), and starry flounder (*Platichthys stellatus*) (Table 2). Threespine sticklebacks were the most common species sampled, with nearly 97% of the fish captured at Site #8. Most (78%) of the tidewater gobies were also captured at Site #8 (Table 2). Of the five months of fall-winter sampling conducted by RTA, November had the lowest species diversity. No salmonids were captured during the November 2014 sampling.

In the relatively high salinity water, juvenile Dungeness crab (*Metacarcinus magister*) and bay shrimp (*Crangon sp.*) were also captured during the November 2014 sampling. The juvenile Dungeness crabs were most abundant within the Salt River main channel, whereas the bay shrimp were captured at most of the sites (Table 2).

Table 2. Species and numbers of fish captured during the November 2014 Salt River fisheries sampling.

DATE	SITE #	Tide-water Goby	Three-spine Stickle-back	Sculpin sp.	Pacific Stag-horn Sculpin	Surf Smelt	Starry Flounder	Juvenile Dungeness Crab	Bay Shrimp <i>Crangon spp.</i>
11/11	#1	0	5	2	0	1	0	5	40
11/11	#17	0	5	1	0	0	0	2	17
11/11	#18	0	0	0	0	0	1	1	2
11/11	#8	15	1,848	2	0	0	0	0	214
11/12	#3	3	21	4	0	0	0	2	21
11/12	#7	0	23	15	0	0	0	6	61
11/12	#10	0	0	1	0	0	0	22	6
11/12	#19	0	0	0	0	0	0	2	3
11/12	#14	3	2	1	0	0	0	0	7
11/12	#9	2	1	3	0	0	0	0	60
11/12	#8	13	101	1	0	0	0	0	85
11/12	#10	0	0	0	0	1	0	2	4
11/12	#1	0	6	0	4	0	0	62	19
11/19	#18	0	0	0	0	0	0	0	0
11/19	#19	0	0	0	0	0	0	1	0
11/19	#1	0	2	2	0	1	0	21	29
Catch Totals		36	2,014	32	4	3	1	126	568

Fish Sampling Results – December 2014

In December, the sampling occurred on the 1st and 2nd (Tables 3 and 4). On the 1st, the high tide (at Humboldt Bay North Spit) was a 7.22 ft at 07:10 hours and the low tide was a 1.12 ft at 13:45 hours. On the 2nd, the high tide (at Humboldt Bay entrance) was a 7.56 ft at 07:58 hours and the low tide was a 0.37 ft at 14:43 hours. Between December 1st and 2nd, the Eel River discharge at Scotia dropped from 11,200 cfs to 4,800 cfs. The increased Eel River discharge and runoff from the Salt River and its tributaries resulted in lower salinity readings that ranged between 3.06 and 11.55 ppt (Table 3).

Table 3. Dates, site numbers, start and end times, and water quality measurements for December 2014 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
12/1/2014	#8	Seine Net – 20 ft	High	09:15	09:35	11.8	3.9	9.87
12/1/2014	#9	Seine Net – 20 ft	High	09:45	10:05	12.2	6.3	9.28
12/1/2014	#3	Seine Net – 30 ft	High	10:20	10:55	12	8.1	3.06
12/1/2014	#17	Seine Net – 20 ft	Low	13:35	14:00	16.1	10.8	3.88
12/1/2014	#14	Seine Net – 20 ft	Low	14:15	14:35	14.2	8.1	10.60
12/1/2014	#1	Seine Net – 30 ft	Low	14:50	15:25	13.8	8.6	5.35
12/1/2014	#10	Seine Net – 30 ft	Low	15:35	15:55	14.0	7.8	7.32
12/2/2014	#1	Seine Net – 100 ft	High	09:05	09:55	12.2	7.5	1.83
12/2/2014	#10	Seine Net – 100 ft	High	10:10	10:45	12.8	8.4	11.55
12/2/2014	#8	Seine Net – 20 ft	Low	14:50	15:05	13.3	5.9	6.60
12/2/2014	#7	Seine Net – 20 ft	Low	15:10	15:30	13.9	N/A	7.96
12/2/2014	#9	Seine Net – 20 ft	Low	15:40	15:55	13.0	N/A	8.76
12/2/2014	#18	Seine Net – 30 ft	Low	16:25	16:50	12.8	N/A	6.34
12/3/2014	#3	Seine Net – 30 ft	Low	16:25	17:00	14.9	N/A	10.40
12/3/2014	#10	Seine Net – 30 ft	Low	17:10	17:25	14.5	N/A	7.29

Eight fish species were captured during the December 2014 sampling: tidewater goby, threespine stickleback, sculpin species, Pacific staghorn sculpin, surf smelt, juvenile coho salmon, longfin smelt (*Spirinchus starksi*), and juvenile Pacific lamprey (*Entosphenus tridentatus*) (Table 4). Threespine sticklebacks were again the most common species captured and comprised 90% of all fish sampled in December 2014. The single juvenile coho salmon was approximately 65 mm in length and was captured at Site #10 during the high tide sampling. The out-migrating juvenile Pacific lamprey was also captured at Site #10 at high tide. The decreased salinity coincided with a drop in the numbers of juvenile Dungeness crabs and bay shrimp. Six of the 12 tidewater gobies were captured at Site #8, upstream of the goby lift. The longfin smelt was caught at Site #1 during low tide sampling when the salinity was 5.35 ppt. This is the farther upstream that a longfin smelt has been sampled within the Salt River.

Table 4. Species and numbers of fish captured during the December 2014 Salt River fisheries sampling.

DATE	SITE #	Tidewater Goby	Juvenile Coho Salmon	Three-spine Stickleback	Sculpin <i>sp.</i>	Pacific Staghorn Sculpin	Surf Smelt	Longfin Smelt	Pacific Lamprey	Juvenile Dungeness Crab	Shrimp <i>Crangon spp.</i>
12/1/2014	#8	3	0	2	0	0	0	0	0	0	0
12/1/2014	#9	0	0	0	0	0	0	0	0	0	0
12/1/2014	#3	0	0	57	0	0	0	0	0	0	0
12/1/2014	#17	0	0	5	2	1	0	0	0	0	2
12/1/2014	#14	0	0	2	0	0	0	0	0	0	1
12/1/2014	#1	3	0	152	8	5	2	1	0	3	418
12/1/2014	#10	0	0	1	1	0	1	0	0	0	2
12/2/2014	#1	0	0	7	1	0	5	0	0	0	3
12/2/2014	#10	0	1	2	0	0	8	0	1	0	0
12/2/2014	#8	3	0	41	0	0	0	0	0	0	0
12/2/2014	#7	0	0	41	1	0	0	0	0	0	6
12/2/2014	#9	1	0	24	23	0	0	0	0	0	1
12/2/2014	#18	0	0	2	0	0	0	0	0	0	0
12/3/2014	#3	2	0	627	6	4	0	0	0	0	2
12/3/2014	#10	0	0	4	7	9	0	0	0	0	3
Catch Totals		12	1	967	49	19	16	1	1	3	438

Fish Sampling Results – January 2015

In January, the sampling occurred on the 13th, 14th, 19th and 20th (Tables 5 and 6). On the 13th, the low tide (at Humboldt Bay North Spit) was a 2.30 ft at 11:59 hours. On the 14th, the low tide was a 1.78 ft at 13:03 hours. On the 19th, the high tide was an 8.25 ft at 10:09 hours. On the 20th, the high tide was an 8.36 ft at 10:58 hours.

Between January 13th and 14th, the Eel River discharge at Scotia dropped slightly from 2,400 cfs to 2,200 cfs. On January 19th and 20th, the Eel River discharge at Scotia went from 7,500 cfs up to 10,400 cfs and down to 6,300 cfs. Salinity measurements ranged from a low of 0.45 ppt to 13.00 ppt (Table 5). The dissolved oxygen meter stopped working in January and we were unable to obtain a functional meter for the remainder of the winter sampling.

Table 5. Dates, site numbers, start and end times, and water quality measurements for January 2015 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
1/13/2015	#1	Seine Net – 30 ft	Low	12:05	12:20	13.3	4.5	0.45
1/13/2015	10	Seine Net – 30 ft	Low	12:30	12:55	13.0	2.0	7.25
1/13/2015	#19	Seine Net – 30 ft	Low	13:05	13:20	13.1	3.3	7.13
1/13/2015	#14	Seine Net – 20 ft	Low	13:20	13:50	19.5	N/A	11.90
1/13/2015	#7	Seine Net – 20 ft	Low	14:00	14:25	17.7	3.4	9.90
1/13/2015	#8	Seine Net – 20 ft	Low	14:30	14:45	16.6	N/A	13.00
1/13/2015	#3	Seine Net – 30 ft	Low	14:50	15:30	14.3	2.1	7.50
1/14/2015	#9	Seine Net – 20 ft	Low	13:00	13:15	13.8	N/A	8.32
1/14/2015	#17	Seine Net – 20 ft	Low	13:20	13:40	12.2	N/A	12.96
1/14/2015	#18	Seine Net – 30 ft	Low	13:45	14:00	11.5	N/A	8.33
1/19/2015	#1	Seine Net – 100 ft	High	10:00	10:40	10.8	N/A	2.54
1/19/2015	#1-A	Seine – 100 ft	High	10:45	11:25	11.4	N/A	2.73
1/19/2015	#20	Seine Net	High	12:00	12:25	11.1	N/A	4.20
1/19/2015	#9	Seine Net	High	12:30	12:50	13.1	N/A	7.33
1/20/2015	#8	Seine Net	High	10:40	11:05	9.2	N/A	6.93
1/20/2015	#17	Seine Net	High	11:15	11:35	11.6	N/A	12.61
1/20/2015	#10	Seine – 100 ft	High	12:35	13:10	12.1	N/A	12.34
1/20/2015	#1-B	Seine – 100 ft	High	13:30	14:10	12.5	N/A	1.23

Seven fish species were captured during the January 2015 sampling: tidewater goby, threespine stickleback, sculpin species, Pacific staghorn sculpin, surf smelt, juvenile coho salmon, and Sacramento pike minnow (*Ptychocheilus grandis*) (Table 6). Three of the four pike minnow were captured at Site #10 at high tide when the salinity was 12.34 ppt and the fourth fish was caught at Site #1 at high tide in much lower salinity (1.23 ppt). Threespine sticklebacks were again the most common species captured and comprised 63% of all fish sampled in January 2015. Six of the nine coho salmon sampled in January were caught at Site #10 at high tide. Only one of the coho salmon was captured during low tide sampling (at Site #17). These nine coho salmon were noticeably larger than the 65 mm individual sampled in December, ranging between 80 and 95 mm in length. No Dungeness crab or bay shrimp were caught during the January 2015 sampling.

Table 6. Species and numbers of fish captured during the January 2015 Salt River fisheries sampling.

DATE	SITE #	Tidewater Goby	Juvenile Coho Salmon	Three-spine Stickleback	Sculpin sp.	Pacific Staghorn Sculpin	Surf Smelt	Sac. Pike Minnow
1/13/2015	#1	2	0	2	0	2	0	0
1/13/2015	10	0	0	0	2	2	0	0
1/13/2015	#19	0	0	0	0	0	18	0
1/13/2015	#14	0	0	3	0	0	0	0
1/13/2015	#7	45	0	46	25	17	0	0
1/13/2015	#8	0	0	13	0	0	0	0
1/13/2015	#3	6	0	20	4	7	0	0
1/14/2015	#9	12	0	20	0	0	0	0
1/14/2015	#17	5	1	8	2	0	2	0
1/14/2015	#18	0	0	4	0	1	1	0
1/19/2015	#1	0	0	3	0	0	9	0
1/19/2015	#1-A	0	1	40	0	1	21	0
1/19/2015	#9	0	0	1	0	0	12	0
1/20/2015	#8	13	0	159	0	0	0	0
1/20/2015	#17	0	0	1	0	0	1	0
1/20/2015	#10	0	6	57	1	0	3	3
1/20/2015	#1-B	0	1	14	1	0	4	1
Catch Totals		83	9	391	35	30	71	4

Fish Sampling Results – February 2015

In February, the sampling occurred on the 17th, 18th, 24th and 26th (Tables 7 and 8). On the 17th, the high tide (at Humboldt Bay North Spit) was a 7.95 ft at 09:56 hours. On the 18th, the high tide was an 8.06 ft at 10:46 hours. On the 24th, the low tide was a 0.69 ft at 10:12 hours. On the 26th, the low tide was a 0.77 ft at 12:31 hours. February was the first month we were able to sample Site #15 because waterfowl hunters were actively hunting in this slough during the previous months.

Between the 17th and 18th, the Eel River discharge at Scotia was between 7,300 cfs and 6,000 cfs. The Eel River discharge at Scotia was approximately 3,800 cfs on the 24th and 3,330 cfs on the 26th. A peak flow of 144,000 cfs occurred on February 7, 2015. Salinity measurements ranged from a low of 365 ppm to 12.62 ppt (Table 7).

Twelve fish species were captured during the February 2015 sampling: tidewater goby, threespine stickleback, sculpin species, Pacific staghorn sculpin, surf smelt, longfin smelt, juvenile coho salmon, Sacramento pike minnow, starry flounder, juvenile Chinook salmon (*Oncorhynchus tshawytscha*), California roach (*Hesperoleucus symmetricus*), and bay pipefish (*Syngnathus leptorhynchus*) (Table 9). Most of the pike minnow (113 of 118 fish) were captured at Sites #1, #1-A, and #1-B at high tide when the salinity was between 1.22 and 1.40 ppt. Threespine sticklebacks were again the most common species captured and comprised 88% of all fish sampled in February 2015. The catch of twenty-three coho salmon in February was well distributed, with fish captured at eight sites. Fourteen coho salmon were captured during high tide sampling and nine were captured during low tide sampling. The growth of juvenile coho salmon in the lower Salt River appeared good, with several fish ranging between 100 and 120 mm in length (Appendix B). The four juvenile Chinook salmon captured in February were between 30 and 40 mm in length and were sampled at three sites (#1, #3, and #19). The four California roach were sampled in low salinity areas and we suspect these fish were flushed down the main Eel River during the large storm event in early February.

Table 7. Dates, site numbers, start and end times, and water quality measurements for February 2015 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
2/17/2015	#1	Seine – 100 ft	High	9:50	10:45	13.5	N/A	1.4
2/17/2015	#1A	Seine – 100 ft	High	11:00	11:45	13.7	N/A	1.22
2/17/2015	#8	Seine – 20 ft	High	12:25	12:40	15.3	N/A	1.69
2/18/2015	#1B	Seine – 100 ft	High	10:00	11:20	13.6	N/A	1.74
2/18/2015	#10	Seine – 100 ft	High	12:10	12:40	12.9	N/A	12.62
2/18/2015	#9	Seine – 20 ft	High	13:45	14:10	13.9	N/A	2.07
2/18/2015	#3	Seine – 30 ft	High	14:25	15:00	13.9	N/A	1.65

Table 7 (continued). Dates, site numbers, start and end times, and water quality measurements for February 2015 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
2/24/2015	#1	Seine – 20 ft	Low	10:15	10:30	10.2	N/A	365ppm
2/24/2015	#3	Seine – 30 ft	Low	10:40	11:20	10.5	N/A	6.98
2/24/2015	#3	Seine – 20 ft	Low	11:25	11:40	15.6	N/A	4.32
2/24/2015	#10	Seine – 30 ft	Low	11:50	12:10	11.0	N/A	5.29
2/24/2015	#19	Seine – 30 ft	Low	12:20	12:40	12.1	N/A	2.24
2/24/2015	#9	Seine – 20 ft	Low	12:55	13:10	19.5	N/A	6.77
2/24/2015	#8	Seine – 20 ft	Low	13:15	13:25	15.4	N/A	8.12
2/24/2015	#7	Seine – 20 ft	Low	13:35	13:55	20.1	N/A	7.37
2/26/2015	#17	Seine – 20 ft	Low	12:30	12:55	13.5	N/A	12.28
2/26/2015	#18	Seine – 30 ft	Low	13:05	13:20	12.9	N/A	6.05
2/26/2015	#15	Seine – 30 ft	Low	14:00	14:20	13.0	N/A	7.46
2/26/2015	#14	Seine – 20 ft	Low	14:50	15:10	15.2	N/A	11.84

Fish Sampling Results – March 2015

In March, the sampling occurred on the 23rd and 24th (Tables 9 and 10). On the 23rd, the low tide (at Humboldt Bay North Spit) was a -0.49 ft at 08:51 hours and the high tide was a 6.18 ft at 15:14 hours. On the 24th, the low tide was a -0.30 ft at 09:45 hours and the high tide was a 5.69 ft at 16:13 hours.

The Eel River discharge at Scotia was between 1,500 and 1,800 cfs on the 23rd and 24th. Salinity measurements ranged from 857 ppm to 27.61 ppt (Table 9).

For the five months of fall-winter sampling, the March 2015 effort resulted in the greatest diversity, with thirteen fish species captured: tidewater goby, threespine stickleback, sculpin species, Pacific staghorn sculpin, surf smelt, juvenile coho salmon, Sacramento pike minnow, California roach, bay pipefish, shiner surfperch (*Cymatogaster aggregate*), saddleback gunnel (*Photis ornate*), Pacific herring (*Clupea harengus*) and an unknown species of juvenile rockfish (*Sebastes sp.*) (Table 10). Threespine sticklebacks were again the most common species captured and comprised 70% of all fish sampled in March 2015. The four juvenile coho salmon captured in March were relatively large, silver in coloration and probably close to smolting (Appendix B). Most of the sculpin captured in March were age-0 fish <30 mm in length (880 out of 960 fish). The four newly settled rockfish were all captured in the drainage ditch section of Site #3. The two saddleback gunnels were captured in same net set at Site #18.

Table 8. Species and numbers of fish captured during the February 2015 Salt River fisheries sampling.

DATE	SITE #	Tide-water Goby	Juvenile Coho Salmon	Juvenile Chinook Salmon	Three-spine Stickle-back	CA Roach	Sculpin sp.	Pacific Stag-horn Sculpin	Surf Smelt	Long-fin Smelt	Bay Pipe-fish	Starry Flounder	Sac. Pike Minnow	Shrimp Crangon spp.
2/17	#1	0	8	0	304	1	2	2	2	0	0	0	43	0
2/17	#1A	0	4	0	100	2	0	2	76	3	0	0	10	0
2/17	#8	7	0	0	19	0	0	0	1	0	0	0	0	0
2/18	#1B	0	2	0	693	7	4	2	1	0	0	0	60	0
2/18	#10	0	0	0	0	0	0	0	9	0	0	0	3	0
2/18	#9	0	0	0	76	0	0	0	0	0	0	0	0	0
2/18	#3	0	0	0	154	0	0	0	0	0	0	0	0	0
2/24	#1	2	0	1	4	0	1	0	0	0	0	0	2	0
2/24	#3	5	4	2	193	2	9	12	2	2	0	0	0	0
2/24	#3	4	0	0	0	0	5	0	0	0	1	0	0	0
2/24	#10	0	2	0	5	0	14	2	0	0	0	1	0	0
2/24	#19	0	0	1	25	0	3	3	1	0	0	0	0	0
2/24	#9	10	0	0	6	0	1	0	0	0	0	0	0	0
2/24	#8	35	0	0	23	0	0	0	0	0	0	0	0	0
2/24	#7	24	1	0	35	0	3	3	1	0	0	0	0	0
2/26	#17	2	1	0	2,060	0	9	6	0	0	0	0	0	0
2/26	#18	0	0	0	0	0	4	0	4	0	0	0	0	0
2/26	#21	0	0	0	0	0	2	8	10	1	0	0	0	10
2/26	#15	1	1	0	40	0	15	5	0	1	0	0	0	0
2/26	#14	0	0	0	0	0	3	0	0	0	0	0	0	0
Catch Totals		90	23	4	3,737	12	75	45	107	7	1	1	118	10

Table 9. Dates, site numbers, start and end times, and water quality measurements for March 2015 Salt River fisheries sampling.

DATE	SITE #	SAMPLE METHOD	TIDE LEVEL	START TIME	END TIME	WATER TEMP (°C)	D.O. (mg/L)	SALINITY (ppt)
3/23/2015	#9	Seine – 20 ft	Low	9:35	10:00	11.6	N/A	13.85
3/23/2015	#17	Seine – 20 ft	Low	10:20	10:50	12.3	N/A	24.99
3/23/2015	#18	Seine – 30 ft	Low	10:55	11:10	12.7	N/A	19.95
3/23/2015	#15	Seine – 30 ft	Low	11:25	11:35	12.5	N/A	27.61
3/23/2015	#1	Seine -30 ft	Low	12:10	12:25	17.3	N/A	1.3
3/23/2015	#10	Seine – 100 ft	High	15:30	16:10	13.1	N/A	26.61
3/24/2015	#8	Seine – 20 ft	Low	9:05	9:30	13.8	N/A	14.87
3/24/2015	#7	Seine – 20 ft	Low	9:35	10:05	13.4	N/A	13.51
3/24/2015	#3	Seine -30 ft	Low	10:25	10:45	13.5	N/A	12.86
3/24/2015	#3	Seine -30 ft	Low	10:50	11:35	15	N/A	857 ppm
3/24/2015	#19	Seine -30 ft	Low	12:05	12:25	14.6	N/A	14.44
3/24/2015	#10	Seine -30 ft	Low	12:30	12:50	15.1	N/A	12.87
3/24/2015	#14	Seine – 20 ft	High	14:00	14:25	21.2	N/A	22.44
3/24/2015	#8	Seine – 20 ft	High	16:05	16:30	19.2	N/A	10.33
3/24/2015	#9	Seine – 20 ft	High	16:45	17:00	19.6	N/A	11.86
3/24/2015	#1-B	Seine – 100 ft	High	17:05	17:20	15.8	N/A	1.22
3/24/2015	#1	Seine – 100 ft	High	17:25	17:55	15.3	N/A	1.14
3/24/2015	#1-A	Seine – 100 ft	High	18:00	18:35	15.2	N/A	1.18

Table 10. Species and numbers of fish captured during the March 2015 Salt River fisheries sampling.

DATE	SITE #	Tide-water Goby	Juvenile Coho Salmon	Three-spine Stickle-back	CA Roach	Sculpin sp.	Pacific Stag-horn Sculpin	Surf Smelt	Pacific Herring	Juvenile Rockfish	Bay Pipe-fish	Shiner Surf Perch	Saddle-back Gunnel	Sac. Pike Minnow	Juvenile Dungeness Crab	Shrimp Crangon spp.
3/23	#9	2	0	4	0	141	0	0	0	0	0	0	0	0	0	0
3/23	#17	0	0	1,487	0	5	2	0	0	0	0	0	0	0	0	0
3/23	#18	0	0	3	0	3	0	1	0	0	0	0	2	0	28	0
3/23	#15	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
3/23	#1	0	0	25	3	42	2	0	0	0	0	0	0	0	0	1
3/23	#10	0	0	20	0	0	0	5	0	0	0	0	0	0	0	0
3/24	#8	31	0	15	0	53	0	0	0	0	0	0	0	0	0	0
3/24	#7	24	0	230	0	167	1	0	0	0	0	0	0	0	0	0
3/24	#3	2	0	9	0	19	3	2	1	0	0	0	0	0	0	0
3/24	#3	13	0	299	2	371	4	0	0	4	0	0	0	2	0	0
3/24	#19	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0
3/24	#10	0	0	127	0	1	0	0	0	0	0	0	0	0	0	0
3/24	#14	1	0	139	0	25	1	0	0	0	0	0	0	0	0	0
3/24	#8	16	0	184	1	25	0	0	0	0	0	0	0	0	0	0
3/24	#9	8	0	7	0	37	0	0	0	0	0	0	0	0	0	0
3/24	#1B	0	0	12	0	0	3	0	0	0	0	0	0	0	0	0
3/24	#1	0	0	123	0	4	26	3	0	0	0	0	0	2	0	2
3/24	#1A	0	4	78	0	1	17	25	0	0	2	0	0	5	0	1
Catch Totals		97	4	2,766	6	901	59	36	1	4	2	1	2	9	28	4

Fish Sampling Results – Summary of Combined Data Sets

Fish sampling within the restored Riverside Ranch reach of the Salt River has occurred for an entire year, from March 2014 to March 2015. A summary of the combined data sets (CDFW, HSU, and RTA) provided a closer examination of species diversity by month and tide; and how frequently each fish species was captured (Table 11). Species diversity appeared greatest during the late-winter into spring months, with nine to 12 species captured in February, March, May, June and July (Table 11). In November, December and January only six to seven species were captured (Table 11). In 2014, no fish sampling occurred in August through October and this may be a period to sample in 2015 to better understand the year-round fish community (Table 11). During the late summer to early fall period, the lower Salt River would most likely be subjected to low freshwater inflows, high salinities, and potentially the warmest water temperatures.

For the five months (November-March) that RTA sampled at both low and high tides, no large differences were apparent in regards to species diversity (Table 11). In February and March, two more species were captured during the low tide versus high tide; however nearly twice as many sites were sampled at low tide versus high tide (Table 11). In regards to juvenile coho salmon, 73% of the coho salmon sampled by RTA were captured during high tide (27 of 37 fish). Surf smelt were also more frequently sampled at high tide versus low tide (74% or 173 of the 233 fish captured).

When broken down by month and tide, a total of 14 distinct periods (or events) were sampled by CDFW, HSU and RTA (Table 11). This facilitated a determination of the “frequency of occurrence” for each fish species sampled in the lower Salt River; with the species listed in the left-hand column from the most frequently sampled down to the least frequently sampled (Table 11). Three spine stickleback, sculpin “species” and tidewater goby were present during all 14 sampling periods. Surf smelt were captured during 12 of the 14 sampling periods, with none sampled in June and July (Table 11). Pacific staghorn sculpin were positively sampled in eight of the 14 sampling events, but RTA suspects this species was more prevalent but may have been lumped into the generic “sculpin species” category by CDFW and HSU. Juvenile coho salmon were captured during seven of the 14 periods and Table 11 depicts the seasonality of their winter to early spring occurrence in the tidal/brackish zone of the lower Salt River. Dungeness crab were present during periods of relatively high salinity and were absent when salinity levels dropped in response to rain events that occurred in January, February and March of 2015 (Table 11). In contrast to Dungeness crab, non-native Sacramento pike minnow were sampled during periods (or in areas) of low salinity (Table 11). Fish species that occurred infrequently may be either rare in occurrence, present in low numbers, or not susceptible to the sampling methods employed by CDFW, HSU and RTA. For example, the single juvenile Pacific lamprey sampled by RTA in December was caught with the 100-foot seine. It had wriggled through the ¼-inch mesh and was almost missed as fish were being collected. The small size of the juvenile Chinook salmon may also account for their infrequent capture with the gear employed (only four fish sampled). Conversely, other species such as starry flounder are relatively strong swimmers and may be able to avoid capture as seine nets are hauled-in at a relatively slow pace.

Table 11. Summary of Salt River fish species diversity by month/tide and fish species occurrence per sampling event. Note: shaded columns indicate months where no fish sampling occurred.

SPECIES LIST	JAN. HIGH TIDE	JAN. LOW TIDE	FEB. HIGH TIDE	FEB. LOW TIDE	MARCH HIGH TIDE	MARCH LOW TIDE	APRIL LOW TIDE	MAY LOW TIDE	JUNE LOW TIDE	JULY LOW TIDE	AUG LOW TIDE	SEPT LOW TIDE	OCT LOW TIDE	NOV. HIGH TIDE	NOV. LOW TIDE	DEC. HIGH TIDE	DEC. LOW TIDE	Number of Occurrences
STICKLEBACK	X	X	X	X	X	X	X	X	X	X				X	X	X	X	14
SCULPIN SP.	X	X	X	X	X	X	X	X	X	X				X	X	X	X	14
TIDEWATER GOBY	X	X	X	X	X	X	X	X	X	X				X	X	X	X	14
SURF SMELT	X	X	X	X	X	X	X	X						X	X	X	X	12
STAGHORN SCULPIN	X	X	X	X	X	X								X			X	8
COHO SALMON	X	X	X	X	X		X									X		7
DUNGENESS CRAB						X		X	X	X				X	X		X	7
PIKE MINNOW	X		X	X	X	X		X										6
BAY PIPEFISH				X	X			X	X	X								5
SHINER SURFPERCH						X		X	X	X								4
CALIFORNIA ROACH			X	X	X	X												4
LONGFIN SMELT			X	X													X	3
TOP SMELT						X	X			X								3
STARRY FLOUNDER				X				X							X			3
SADDLEBACK GUNNEL					X				X	X								3
CHINOOK SALMON				X			X			X								3
JUVENILE SMELT SP.									X	X								2
PACIFIC HERRING						X			X									2
JUVENILE ROCKFISH						X		X										2
PACIFIC LAMPREY																X		1
NIGHT SMELT								X										1
Number of Species	7	6	9	12	10	12	7	11	9	10				6	6	6	7	

Salt River Fall and Winter Sampling – Discussion

The fall and winter Salt River sampling resulted in the capture of 17 fish species, as well as Dungeness crab and bay shrimp. Threespine sticklebacks were consistently the most common species captured, comprising 63% to 97% of the monthly totals. Juvenile coho salmon were first sampled in December and their numbers peaked during the February sampling. Tidewater gobies were more frequently sampled in the sloughs and smaller channels than within the Salt River main channel. Tidewater gobies were consistently sampled within the short sample reach above the goby lift at Site #8, at both low and high tides.

After the large peak flows in February, we noted sediment aggradation at several sampling sites, mainly at #7, #9 and #14. At low tide, these sites appeared to be much shallower than prior to the 144,000 cfs peak flow in the Eel River. At site #14, the goby lift located downstream of the sampling location appeared to have partially failed (incised) during the high flows. We recommend that additional observations and monitoring are conducted to assess the functionality and longevity of the excavated sloughs, side channels and goby lifts.

Setting the 100-foot seine with a kayak proved to be an effective method for sampling the Salt River's main channel at high tide. We recommend that high tide sampling be continued. Over the course of trial-and-error, we identified three main factors in successful sampling with the 100-foot net:

1. Avoid attempting to set a dry net that had been stored since the previous month's sampling. Setting a dry net usually resulted in a tangled net or a wrapped lead line. On the first set of a sampling day, we recommend laying the dry 100-foot net out in the river channel, completing wetting it down, and carefully restacking it into the cooler.
2. Only sample areas with gently sloped banks that allowed the lead line to remain close to the channel bottom when the net was pulled-in. Steep, near vertical, banks as found at Sites #18 and #19 resulted in very few fish being captured.
3. Only set the 100-foot net at the top of the tide when the current was slack. The timing of this third factor was crucial because setting the 100-foot net in a moving current usually resulted in the net being swept to the up-current bank with the cork line running over the top of the lead line and few, if any, fish being captured. Depending on the main channel sampling site, the timing and duration of slack water at high tide varied greatly. At lower sites, such as #10 and #18, we observed slack water durations of less than 10 minutes at high tide, barely enough time to complete three sets of the 100-foot net. At these lower sites, the lag in tidal times was approximately 60 to 90 minutes behind the tide times listed for the Humboldt Bay North Jetty. At the upper sites (#1, #1-A and #1-B), water remained slack at high tide for extended periods (at least 30 to 45 minutes). The tidal time lag (Salt River versus North Jetty) also appeared greater when compared to the lower sampling locations.

During high tide sampling in the main channel, we consistently captured more fish at the upper sites (#1, #1-A and #1-B) compared to the lower sites (#10, #18 and #19). We suspect that the upper sites may be more attractive for fish due to the extended periods of slack water compared to lower reaches where the current was constantly moving. The upper sites were also within a channel reach lined with mature riparian trees and several deadfalls extending into the water, thus possibly providing in-channel habitat and overhead cover that was generally lacking at the lower main channel sites.

In November and December, we set minnow traps baited with frozen salmon roe at numerous sites and fished them for at least an hour before checking. These traps caught very few fish, thus we stopped using the traps for the remainder of the fall and winter sampling. Minnow traps may be a feasible way to sample the newly constructed channel located upstream of the Riverside Ranch due to its narrow width and nearly vertical banks defining the main channel.

Finally, we recommend that fisheries sampling be continued in the lower Salt River to better understand the temporal and spatial use of the restored channel by the various fish species. We recommend that sampling continue at the 11 established sites and that additional sites are established upstream of Riverside Ranch as the channel excavation process continues.

APPENDIX A: CATALOG OF SALT RIVER SAMPLE SITES

Site #1: Main channel of the Salt River near the Riverside Ranch barn and telephone pole on the main access road. Seine about 150 feet upstream of telephone pole.



Site #1-A: Located on the main channel, downstream of Site #1 near the downstream end of the Riverside Ranch barn. This site was sampled only at high tide with kayak and 100-foot seine.



Site #1-B: Located on the main channel, upstream of Site #1 between stage plate and confluence of Reas Creek. This site was sampled only at high tide with kayak and 100-foot seine.



Site #3: Located at confluence of S1 slough and tide gate drainage channel. Seine both the S1 slough (approximately 150 feet) and the drainage channel from the confluence up to the tide gate.



Site #3: Photographs of tide gate and drainage channel.



Site #7: Located in the upper end of the S1 slough and is associated with a piece of placed LWD. Approximately 100 feet of channel was sampled on both sides of LWD.



Site #8: is associated with a goby lift on a branch of the S1 slough. Seine from lift to the upstream end of channel.



Site #9: is associated with a goby lift on a branch of the S1 slough, near the upper end of the slough. Seine from lift to the upstream end of channel.



Site #10: is located on the Salt River main channel between the mouths of north and south sloughs. The site is accessed from the one side road that leaves the Riverside Ranch main road.



Site #14: Access Site #14 from the side road taken down to #10 and #19. Site #14 is on branch of N1 slough that has a terminal end. Seine uppermost 150 feet of channel.



Site #15: Located on the Northern Slough's main channel, just upstream of the 2nd branch off of the slough. We parked vehicle at end of levee road to access Site #15.



Site #17: Located on the Northern Slough's main channel, just upstream of the 2nd branch off of the slough.



Site #18: Lowest main channel sampling site, accessed from turnaround at end of levee road.



Site #19: Located at confluence of the Salt River main channel and Northern Slough.



APPENDIX B: CATALOG OF FISH SAMPLED IN THE SALT RIVER
BETWEEN NOVEMBER 2014 AND MARCH 2015

Threespine Stickleback (*Gasterosteus aculeatus*)



Gravid female captured in March of 2015



Male in spawning colors captured in March of 2015



Age-0 and adult captured in March of 2015

Tidewater Goby (*Eucyclogobius newberryi*)



Tidewater goby captured at Site #8 on February 24, 2015

California Roach (*Hesperoleucus symmetricus*)



California roach captured at Site #1 on March 23, 2015

Pacific Staghorn Sculpin (*Leptocottus armatus*)



Adult Pacific staghorn sculpin captured at Site #18 on February 26, 2015



Age-0 Pacific staghorn sculpin captured in March of 2015

Sculpin Species (*Cottus sp.*)



Sculpin sp. captured at Site #7 on November 12, 2014



Comparison of Pacific staghorn sculpin (left) and sculpin species (right) from Site #3 on February 24, 2015

Starry Flounder (*Platichthys stellatus*)



Starry flounder caught at Site #18 on November 11, 2014



Starry flounder caught at Site #18 on February 24, 2015

Coho Salmon (*Oncorhynchus kisutch*)



Coho salmon: 65 mm juvenile captured on December 2, 2014



Coho salmon: 90 mm juvenile captured on January 20, 2015

Coho Salmon (*Oncorhynchus kisutch*)



Coho salmon: 120 mm juvenile captured on February 17, 2015



Coho salmon: 135 mm juvenile captured on March 24, 2015

Chinook Salmon (*Oncorhynchus tshawytscha*)



Chinook salmon: 30 mm juvenile captured at Site #1 on March 24, 2015



Chinook salmon: 35 mm juvenile captured at Site #3 on March 24, 2015

Surf Smelt (*Hypomesus pretiosus*)



Two of the 71 surf smelt captured during the January 2015 sampling



Juvenile smelt (50 mm in length) captured at Site # on November 11, 2014

Longfin Smelt (*Spirinchus starksi*)



Longfin smelt (130 mm in length) captured at Site #1 on December 1, 2014



Two longfin smelt captured at Site #1-A on February 17, 2015

Pacific Herring (*Clupea harengus*)



Juvenile herring (30 mm in length) captured at Site #3 on March 24, 2015

Sacramento Pikeminnow (*Ptychocheilus grandis*)



One of nine Sacramento pikeminnow caught during the March 2015 sampling

Shiner Surfperch (*Cymatogaster aggregata*)



Shiner surfperch (160 mm in length) captured at Site #19 on March 24, 2015

Saddleback Gunnel (*Photis ornata*)



One of two saddleback gunnel caught at Site #18 on March 23, 2015

Pacific Lamprey (*Entosphenus tridentatus*)



Juvenile (out-migrant) Pacific lamprey caught at Site #10 on December 2, 2014

Rockfish species (*Sebastes* sp.)



One of four juvenile (newly settled) rockfish caught at Site #3 (in the drainage ditch) on March 24, 2015

Bay Pipefish (*Syngnathus leptorhynchus*)



One of two bay pipefish caught at Site #1-A (high tide site) on March 24, 2015



Close-up of bay pipefish caught at Site #1-A (high tide site) on March 24, 2015

Dungeness Crab (*Metacarcinus magister*)



Two of 28 Dungeness crab caught at Site #18 on March 23, 2015; male (left) and female (right)

Bay Shrimp (*Crangon Sp.*)



One of two bay shrimp caught at Site #1 on March 24, 2015