

Smelt Working Group  
March 21, 2016

**Meeting Summary**

The Working Group reviewed current Delta Smelt distribution, salvage data, and Delta conditions. The Working Group agreed that the relative risk of entrainment to adult Delta Smelt has increased given current hydrology. Members noted that spawning likely is well underway, and adults are most likely holding their positions, rather than continuing migration. In light of this, the group's discussions primarily focused on the entrainment risk to larval and juvenile Delta Smelt.

The Working Group described the risk of entrainment under the Service-provided advice framework. Under this framework the relative risk of entrainment for OMR flow ranges is discussed and assessed. For the current week, the risk of entrainment of larval and juvenile Delta Smelt for each of the flow ranges is characterized as follows:

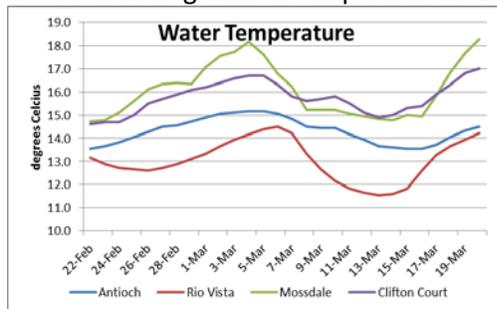
- -1250 to -2000 cfs has a low risk of entrainment,
- -2000 to -3500 cfs has a low to medium risk of entrainment,
- -3500 to -5000 cfs has a medium to high risk of entrainment.

The Working Group is following guidance for entrainment protections from both Action 2 (adult Delta Smelt) and Action 3 (juvenile Delta Smelt). The Working Group will continue to monitor Delta Smelt survey and salvage data and Delta conditions, and will meet again on Monday, March 28, 2016 at 10 am.

**Reported Data**

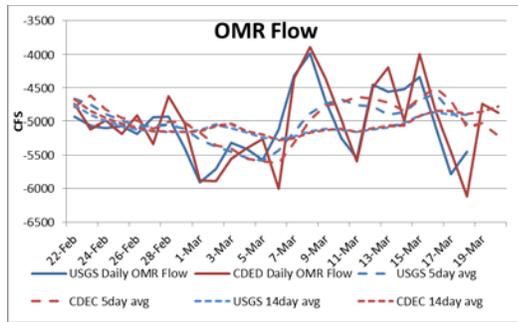
1. Current environmental data
  - a. Temperature

3 station average water temperature is 15.7°C.



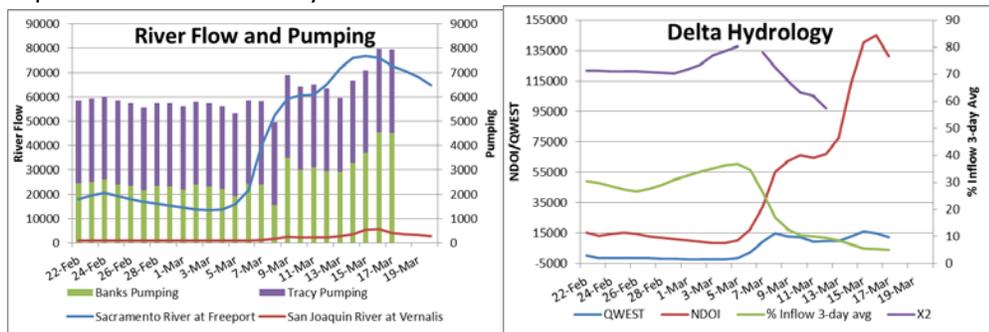
- b. OMR flow

USGS OMR daily, 5-day, and 14-day average flows on March 18 are -5450, -5036, and -4906 cfs, respectively. The CDEC OMR daily, 5-day, and 14-day average flows for March 20 were -4877, -5209, and -4778 cfs, respectively.



c. River Flows and pumping

Sacramento River at Freeport flow for March 20 was 64,855 cfs. San Joaquin River at Vernalis river flow for March 20 was 2,775 cfs. X2 is downstream of 57km. Combined exports are 6650 cfs today. Qwest for March 20 was +7105.



d. Turbidity

2. Delta fish monitoring

CDFW has released the 2015 FMWT indices:  
 The 2015 Delta Smelt annual FMWT index is 7.  
 The 2015 Longfin Smelt annual FMWT index is 4.  
 Both indices are the lowest on record (i.e. since 1967).

Smelt Larva Survey (SLS) #6 was in the field last week. Sample processing is 43% complete. Two Delta Smelt were detected (5 mm length), one each at stations 815 and 906. Non-QA/QC-ed samples indicate Delta Smelt presence at other stations; these data are not yet ready to be released. SLS # 6 is the final SLS of the year.

Spring Kodiak Trawl #3 was in the field the week of March 7. A total of seven adult Delta Smelt were collected, six from station 719 and one from station 606. Most fish were either spent or ripe.

20-mm survey #1 was in the field last week. Sample processing has begun this week. No results are available yet.

The Early Warning Survey began November 30.

Date	Location	Delta Smelt Catch
3/14	Prisoners Point	1
3/15	Jersey Point	1
3/16	Prisoners Point	0
3/17	Jersey Point	0
3/18	Station 902	0

Starting this week, the Early Warning Survey is scheduled at Prisoners Point each Monday, Jersey Point each Tuesday, and Station 902 each Wednesday.

**3. Modeling**

DWR is no longer planning to provide turbidity forecast modeling to the DCT; no turbidity forecast modeling results were provided or reviewed this week.

**4. Salvage**

No Delta Smelt salvage has occurred since February 22. The cumulative season total of salvaged adult Delta Smelt is 12, which represents 29% of the concern level of the WY 2016 adult Delta Smelt incidental take.

No adult Longfin Smelt have been observed in salvage sampling at either the federal or state Delta facilities during the current water year. Two juvenile Longfin Smelt were salvaged on March 9 at the SWP; eight juvenile Longfin Smelt were salvaged on March 11 at the CVP. Combined salvage of >20 mm Longfin Smelt is ten for the season

Larval sampling operations have begun at both the SWP and CVP. No larval Delta Smelt has been detected in the samples processed so far this season. Larval Longfin Smelt were detected at the SWP on March 16.

**5. Expected Project Operations**

Jones pumping plant is pumping 3400 cfs today. The daily average intake to Clifton Court (CC) is 3250 cfs. Combined pumping is 6650 cfs today. Pumping will decrease at the SWP later in the week to match the flow decrease at Vernalis.

**6. Delta Conditions Team**

DCT met on March 18. DWR is no longer planning to distribute turbidity forecast modeling to the DCT; no turbidity forecast modeling results were provided to or reviewed by the Working Group this week.

**7. Assessment of Risk:**

BiOp Background

RPA Component 1, Action 2 states, “An action implemented using an adaptive process to tailor protection to changing environmental conditions after Action 1. As in Action 1, the intent is to protect pre-spawning adults from entrainment and, to the extent possible, from adverse hydrodynamic conditions.” “The range of net daily OMR flows will be no more negative than -1,250 to -5,000 cfs. Depending on extant conditions specific OMR flows within this range are recommended by the Working Group from the onset of Action 2 through its termination...”

RPA Component 2, Action 3: “The objective of this RPA component (which corresponds to Action 3 in Attachment B), is to improve flow conditions in the Central and South Delta so that larval and juvenile delta smelt can successfully rear in the Central Delta and move downstream when appropriate” (page 282).

The WY 2016 adult Delta Smelt incidental take (IT) is 56, as stated in the Service’s December 23, 2015 memo to the Bureau of Reclamation. The concern level is 42. The method to calculate the adult IT is described on p 386 of the 2008 BiOp, with the corrections described in both the February 22, 2013, and December 23, 2015 memos. The alternative approach that the Service presented to the 2015 independent review panel at the Long-term Operation Biological Opinions annual science review will be piloted this year.

The WY 2016 larval/juvenile Delta Smelt incidental take is 392, and the concern level is 261. The method to calculate the larval/juvenile IT is described on p 389, with revision provided in the February 22, 2013 Service memo to the Bureau of Reclamation.

2015 Delta Smelt abundance

The four primary 2015 annual abundance indices for all Delta Smelt life stages are the lowest on record.

	2014	2015
SKT	30.1	13.8
20-mm	1.1	0.3
TNS	0.5	0.0
FMWT	9	7

Discussion

The Working Group concluded that overall risk of entrainment of adult Delta Smelt into the south Delta continues to be low, although there was a moderate concern for the higher OMR flow levels. Adult Delta Smelt were caught at Prisoners Point on March 14 and at Jersey Point on March 15, indicating that adults remain in the system. Turbidity levels are variable over the central and southern Delta. Water temperatures dropped slightly last week, but have been increasing for the past few days. Members do not expect to see detection of adults at the levels seen when catches peaked (>8 at Jersey and >4 at Prisoners at the end of December-beginning of January) in the early warning survey. Given that detections of ripe females in the Early Warning Survey as early as January 16, on February 8 in the Spring Kodiak Trawl Survey, and again at the SWP export facilities on February 18, and the elevated water temperatures since, members indicated that migration likely has tapered off, that spawning is well underway, and that young of the year Delta Smelt are present in the system.

The Working Group concluded that the overall risk to larval and juvenile Delta Smelt has increased since last week. Larval Delta Smelt were collected at stations 906 and 815 in SLS 6. Hydrology is favorable today, but expected to become less favorable to entrainment over the remainder of the week. Members expect Delta Smelt hatching to continue for some time in the Delta, and the central Delta in particular.

Presence of larval Delta Smelt was confirmed last week at stations 906 and 815. This observation is consistent with the last detections of ripe Delta Smelt in the lower San Joaquin

River, and the Working Group assumes spawning occurred, and is occurring, in the lower San Joaquin River, as well as potentially in the Old River corridor. The Working Group has concern regarding larvae in the Old River corridor, given that transport downstream would need to come from the east side streams or the San Joaquin River, rather than from the Sacramento River, and these streams are decreasing. Hatching is expected to continue in the lower San Joaquin River, and possibly Old River, over the next several weeks.

The earlier life stages of Delta Smelt are at greater risk for entrainment, given that they behave more like a particle than older life stages. Older life stages have greater ability to control their position in the water column. Given data from the past six years, members noted that the typical first detection of larval Delta Smelt is mid-March, while data from the previous two years indicates the first detection to be early March, a shift potentially associated with drought conditions and warmer temperatures.

Last week, the Working Group based their risk assessment for larval Delta Smelt on PTM runs. PTM was requested for the next week and details were to be requested by email.

The above discussion points influenced and contributed to all three flow ranges described below:

Advice Framework OMR Level Risk Ranking and Discussion—**Larval Delta Smelt**

- OMR flow of -1250 to -2000 cfs: There is a low risk of entrainment under this flow range. This is the most protective range for larval Delta Smelt.
  - Risk factors: lowest annual indices on record, low likelihood of detection.
  - Salvage: None so far this season, geographic influence of the pumps does not extend to central Delta under this flow range
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes.
  - Persistence of risk: expected to continue at least through March 28.
- OMR flow of -2000 to -3500 cfs: There is a low to medium risk of entrainment under this flow range, given conditions listed below:
  - Risk factors: lowest annual indices on record.
  - Salvage: none so far this season, geographic influence of the pumps not likely to extend to central Delta under this flow range
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes.
  - Persistence of risk: expected to continue until Qwest becomes negative. As Qwest becomes more negative, entrainment risk is expected to increase.
- OMR flow of -3500 to -5000 cfs: There is a medium to high risk of entrainment under this flow range.
  - Risk factors: lowest annual indices on record.
  - Salvage: none so far this season, geographic influence of the pumps is likely to extend to central Delta under this flow range.
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes.

- Persistence of risk: expected to continue until Qwest becomes negative. As Qwest becomes more negative, entrainment risk is expected to increase.

Advice Framework OMR Level Risk Ranking and Discussion—**Adult Delta Smelt**

- OMR flow of -1250 to -2000 cfs: There is a low risk of entrainment under this flow range. This is the most protective range for Delta Smelt.
  - Risk factors: lowest annual indices on record.
  - Salvage: None since February 22, geographic influence of the pumps does not extend to central Delta under this flow range
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes; low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River).
  - Persistence of risk: expected to continue through remainder of the season
- OMR flow of -2000 to -3500 cfs: There is a low risk of entrainment under this flow range, given conditions listed below:
  - Risk factors: lowest annual indices on record.
  - Salvage: none since February 22, geographic influence of the pumps not likely to extend to central Delta under this flow range
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes, low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River).
  - Persistence of risk: expected to continue through remainder of the season.
- OMR flow of -3500 to -5000 cfs: There is a medium risk of entrainment under this flow range. Some members indicated this flow range had a high risk of entrainment.
  - Risk factors: lowest annual indices on record, reduced turbidity in the south Delta (although elevated turbidity at Prisoner’s Point this morning coincided with the catch of a Delta Smelt at the same location).
  - Salvage: none since February 22, geographic influence of the pumps is likely to extend to central Delta under this flow range.
  - Unknowns: detection ability in salvage and trawl surveys has been severely reduced, given the record low abundance indexes, low Sacramento River catch densities (unable to assess percentage of population in the lower San Joaquin River).
  - Persistence of risk: expected to continue until spawning has completed

The Working Group will continue to monitor conditions and smelt distribution and will meet again on Monday, March 28, 2016.

## WEEKLY ADVICE FOR THE DEPARTMENT OF FISH AND WILDLIFE FOR LONGFIN SMELT

### **Advice for week of March 21, 2016:**

The Smelt Working Group does not have any advice for Longfin Smelt based on recent information.

A single Longfin Smelt larva was detected at stations influenced by Barker Slough operations, but based on recent operations (zero exports), no advice is necessary (see #5 below).

### **Basis for advice:**

The 2009 State Water Project 2081 for Longfin Smelt states that advice to WOMT and the DFW Director shall be based on:

1. Adult Salvage – total adult ( $\geq 80$  mm) Longfin Smelt salvage (SWP+CVP) for December through February  $> 5$  times the Fall Midwater Trawl Longfin Smelt annual abundance index.
2. Adult abundance, distribution or other information indicates that OMR flow advice is warranted.
3. Larva distribution in the Smelt Larva Survey or the 20-mm Survey finds Longfin Smelt larvae present at 8 of 12 central and south Delta sampling stations in 1 survey (809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919; see Figure 1).
4. Larva catch per tow exceeds 15 Longfin Smelt larvae or juveniles in 4 or more of the 12 survey stations listed.
5. During the period January 15 through March 31 of a dry or critically dry water year only, advice for Barker Slough pumping plant operations may be warranted if larval Longfin Smelt are detected at station 716 and other information indicates risk of entrainment.

### **Discussion of Criteria**

1. On March 9, 2016, the first Longfin Smelt was salvaged for the water year, a young-of-the-year ( $\geq 20$  mm); additional young-of-the-year were salvaged on March 11 for a total salvage of 10. A larva was collected at the CVP on March 16. Salvage of young-of-the-year does not count toward the adult salvage limit for advice. The **Longfin Smelt adult salvage threshold for advice is 20** based on a Fall Midwater Trawl abundance index of 4 for 2015 (see criterion in #1 above). No advice is warranted based on this criterion.

2. No sampling was conducted in February or as of the 21<sup>st</sup> in March by the Bay Study. January Bay Study sampling detected no Longfin Smelt in the lower San Joaquin or Sacramento rivers. Chipps Island trawling most recently collected Longfin Smelt on February 22 (n=1) and 24 (n=2), but none during February 28 through March 12. December Bay Study sampling collected no Longfin Smelt in the San Joaquin River. The December Fall Midwater Trawl sampled the region and did not detect Longfin Smelt in the San Joaquin River or the south Delta. Distribution information does not indicate advice is warranted based on this criterion.

3 & 4. The sixth and last Smelt Larva Survey (SLS) of 2016 was completed during the week of March 14<sup>th</sup>, but sample processing remains incomplete. Only a single Longfin Smelt larva was

detected at 1 of 12 criteria stations (Table 1, Figure 1). Neither the distribution (Basis for advice #3) nor the catch density (Basis for advice #4) criterion was achieved. Over all, catches of Longfin Smelt larvae remain very low.

5. The February 1 water supply index forecast at 50 percent exceedance remains within the “dry” range of water year types, and triggers review of larva distribution and Barker Slough operations. During SLS 6, a single larva was detected at station 716; the sample for 723 remains to be processed (Table 1, Figure 1). Barker Slough exports dropped to zero on March 2 and remained at zero through March 17. The current Barker Slough operations are protective of Longfin Smelt.

**Current conditions:** The Sacramento River flow decreased to 64,855 cfs on March 20 and the San Joaquin River at Vernalis was 2,775 cfs. Also on March 20, Qwest was +7,105 cfs; combined State and federal exports were 6,650 cfs targeting an OMR of -5,000 cfs. Export facilities will continue to target -5,000 cfs, so exports will decrease with decreasing San Joaquin River inflow. Barker Slough exports dropped to 0 cfs on March 2 and have remained at that level through March 17.

There is no new adult distribution information. Bay Study sampling was not conducted in February and has not been started in March to date. During January sampling, Bay Study detected no Longfin Smelt within the Delta and Suisun Bay. Chipps Island Trawl sampling has collected very few Longfin Smelt this water year (almost all adult size): one adult and one juvenile on February 24<sup>th</sup>, one adult on February 22<sup>nd</sup>, three on February 8<sup>th</sup>, one each on the 11<sup>th</sup> and the 12<sup>th</sup>; eight Longfin Smelt were collected January 13<sup>th</sup>; two adults on December 18 and the third adult on December 23.

The Smelt Larva Survey #6 caught only a single larvae at a single station in the central and south Delta (Table 1), and thus did not achieve either trigger criterion (Criteria 3 & 4 above). A single larva was also detected at station 716, the criterion station for potential advice on Barker Slough operations during dry and critical water-year types.

Beginning March 9 and 11, 10 young-of-the-year Longfin Smelt ( $\geq 20$  mm) have been salvaged this water year and a single larvae ( $< 20$  mm) was detected at the CVP on March 16. There is no young-of-the-year salvage target for advice. In contrast, the threshold salvage of adults for advice is 20 for this water year. None have been salvaged to date.

**Summary of Risk:** Risk of entrainment in the south Delta is low due to a strong positive Qwest and extremely limited detections of larvae in central and south Delta criteria stations. Qwest will likely remain positive for several more days as high runoff enters from eastern Delta tributaries. A decreasing likelihood continues of additional larvae hatching in the lower San Joaquin River, and larva numbers are likely to be low (Table 1). We currently have no information indicating much or any spawning in the central or south Delta.

The Barker Slough distribution trigger (presence at Smelt Larva Survey station 716) was maintained with a single larva (Table 1, Figure 1). Nonetheless, Barker Slough exports stopped

as of March 2 and had not resumed as of March 17, so there is no risk of entrainment at this location.

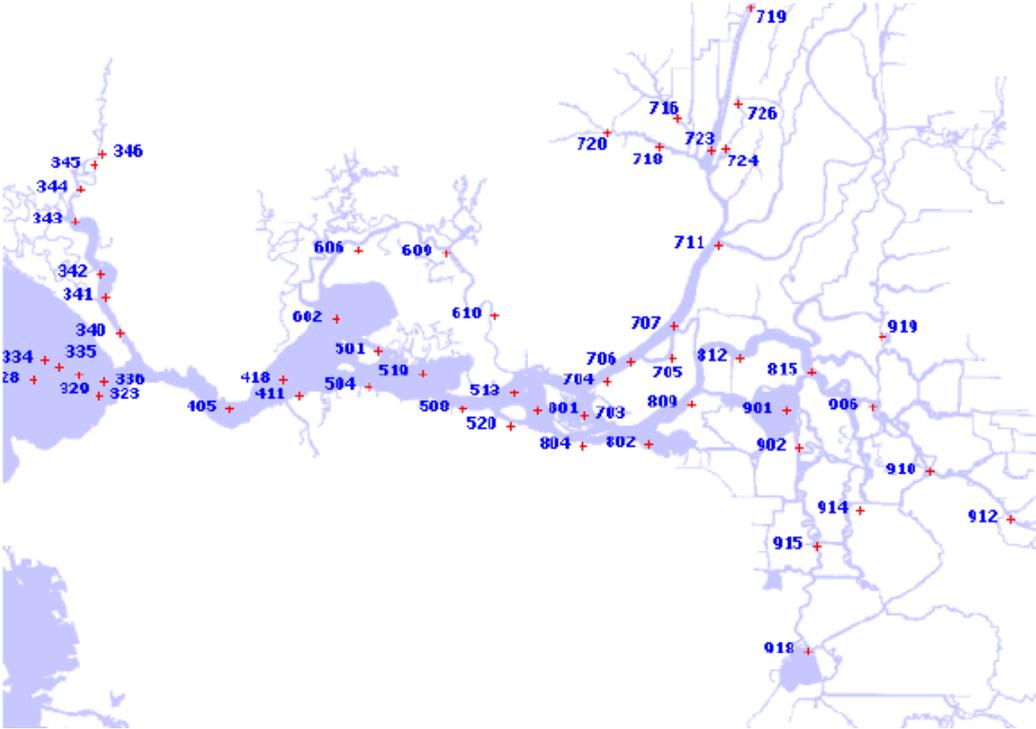
Table 1. Longfin Smelt catch by station in Smelt Larva Survey 6. Sample processing is incomplete.

Year	Survey #	SLS Station	Sample Status	Species	Smelt Catch
2016	6	340	Not yet processed		
2016	6	342	Not yet processed		
2016	6	343	Not yet processed		
2016	6	344	Not yet processed		
2016	6	345	Not yet processed		
2016	6	346	Not yet processed		
2016	6	347	Not yet processed		
2016	6	348	Not yet processed		
2016	6	349	Not yet processed		
2016	6	405	Not yet processed		
2016	6	411	Not yet processed		
2016	6	418	Not yet processed		
2016	6	501	Not yet processed		
2016	6	504	Not yet processed		
2016	6	508	Not yet processed		
2016	6	513	Processed		No Smelt Catch
2016	6	519	Not yet processed		
2016	6	520	Not yet processed		
2016	6	602	Not yet processed		
2016	6	606	Not yet processed		
2016	6	609	Not yet processed		
2016	6	610	Not yet processed		
2016	6	703	Not yet processed		
2016	6	704	Not yet processed		
2016	6	705	Processed		No Smelt Catch
2016	6	706	Not yet processed		
2016	6	707	Not yet processed		
2016	6	711*	Processed		No Smelt Catch
2016	6	716	Processed	Longfin Smelt	1
2016	6	723	Not yet processed		
2016	6	801	Not yet processed		
2016	6	804	Not yet processed		
2016	6	809	Processed		No Smelt Catch
2016	6	812	Processed		No Smelt Catch
2016	6	815	Processed	Delta Smelt	1
2016	6	901	Processed	Longfin Smelt	1
2016	6	902	Processed		No Smelt Catch
2016	6	906	Processed	Delta Smelt	1
2016	6	910	Processed		No Smelt Catch
2016	6	912	Processed		No Smelt Catch
2016	6	914	Processed		No Smelt Catch
2016	6	915	Processed		No Smelt Catch
2016	6	918	Processed		No Smelt Catch
2016	6	919	Not yet processed		

SMP ITP Criteria Stations

\*Reduced tow time  
Processing is complete through 3/17/16.

Figure 1. DFW's Smelt Larva Survey/20-mm Survey station locations.



**SWG Weekly Salvage Update**  
 Reporting Period: March 14-20, 2018  
 Prepared by Bob Fujimura on March 22, 2018: 9:50  
 Preliminary Results -Subject to Revision

Species/Life Stage	Daily Salvage							Trend	
	14-Mar	15-Mar	16-Mar	17-Mar	18-Mar	19-Mar	20-Mar		
<b>Adult Delta Smelt</b>									
SWP	0	0	0	0	0	0	0	→	0
CVP	0	0	0	0	0	0	0	→	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	→	<b>0.0</b>
CUM TAKE	12	12	12	12	12	12	12		0
% of 2016 CL	29%	29%	29%	29%	29%	29%	29%		
<b>Juvenile Longfin Smelt</b>									
SWP	0	0	0	0	0	0	0	→	0
CVP	0	0	0	0	0	0	0	→	0
<b>TOTAL</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	→	<b>0</b>
<b>SWP daily export</b>	<b>6,485</b>	<b>7,336</b>	<b>8,981</b>	<b>8,940</b>	<b>7,219</b>	<b>7,189</b>	<b>7,362</b>	↗	<b>7,645</b>
<b>CVP daily export</b>	<b>6,765</b>	<b>6,747</b>	<b>6,809</b>	<b>6,782</b>	<b>6,780</b>	<b>6,777</b>	<b>6,776</b>	→	<b>6,777</b>
<b>SWP reduced counts</b>	0%	0%	0%	0%	0%	0%	0%	→	0%
<b>CVP reduced counts</b>	0%	0%	0%	0%	0%	0%	0%	→	0%
<b>SWP larval samples</b>	100%	100%	100%	100%	100%	100%	100%	→	100%
<b>CVP larval samples</b>	100%	100%	100%	100%	100%	100%	100%	→	100%
<b>DS larvae present - SWP</b>	N	N	N	N	N	N	N	→	
<b>DS larvae present - CVP</b>	N	N	N	N	N	N	N	→	
<b>LFS larvae present - SWP</b>	N	N	N	N	N	N	N	→	
<b>LFS larvae present - CVP</b>	N	N	Y	N	N	N	N	↘	

TOTAL = combine daily salvages for CVP+SWP; daily water export = AF; Trend = compared to previous week  
 NA = not available at the time of this report; NS = not sampled  
 Reduced counts = percentage of time that routine salvage sample time were less than 30 min per 2 hours of salvage and export operations  
 Larval samples = percentage of daily scheduled samples taken during periods of water export  
 Yellow highlighted dates indicate fish salvage facility outage occurred. Both cases were 15 minutes in duration.  
 Larvae present = whether Delta Smelt (DS) or Longfin Smelt < 20 mm was observed from daily fish larva collections at the SWP or CVP fish facilities

Generated by Bob Fujimura on March 20, 2016

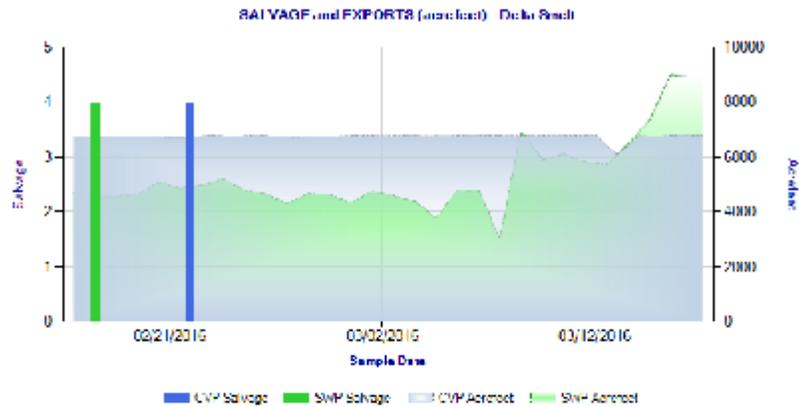


Figure 1. Daily salvage of Delta Smelt and water exports from the state and federal fish salvage facilities during Feb 17-March 17, 2016. Graph obtained from the DFG salvage monitoring web-page: <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx>

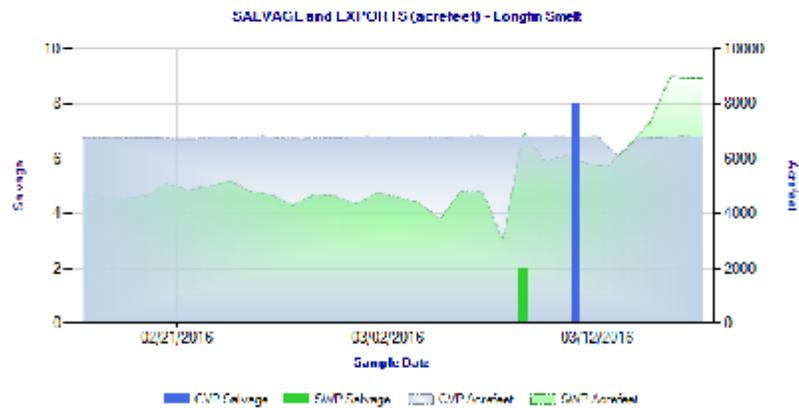


Figure 2. Daily salvage of Longfin Smelt and water exports from the state and federal fish salvage facilities during Feb 17-March 17, 2016. Graph obtained from the DFG salvage monitoring web-page: <http://www.dfg.ca.gov/delta/apps/salvage/SalvageExportCalendar.aspx>

California Department of Fish and Wildlife - Results Subject to Revision

Prepared by Geir Aasen

Report Date: 3/18/2016

Table 1. Smelt less than 20 mm fork length (FL) observed in larval samples from 0300 hours on 3/1/2016 through 0300 hours on 3/17/2016 at SWP and from 3/1/2016 through 3/17/2016 at CVP. Fish size is reported in total length (TL) unless specified as fork length (FL).

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Date	Facility	Species	Total length (mm)
3/16/2016	CVP	Longfin Smelt	16.6

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