

State Water Project Incidental Take Permit Risk Assessment for Delta Smelt and Longfin Smelt

Section 1: Overview

Date: 6/7/2022

Life Stages Present:

Delta Smelt (DS): Adults, juveniles, and larvae

Longfin Smelt (LFS): Adults, sub-adults, juveniles, and larvae

Advice to Water Operations Management Team (WOMT):

No advice.

Risk Assessment:

Delta Smelt: One larval DS was detected over two months ago in the OMR Corridor and any fish in this area are at an increased likelihood of entrainment. Based on full QA/QC, one juvenile DS from EDSM was collected on 5/23/2022 in the Sacramento Deep Water Ship Channel (SDWSC, previous assessment listed four based on primary ID). This season, larval and juvenile DS have been detected in the Lower San Joaquin River, the Lower Sacramento River, Old River, the confluence, and the North Delta. DS adults and sub-adults are less likely to move into the south and central delta since turbidity remains low. DS spawning is likely winding down due to increasing water temperatures and timing.

Barker Slough: COA 8.12 was not triggered by 20mm survey 6, as no DS were detected at station 716. This COA off-ramps June 30th and if the OMR management season off-ramps before June 30th, the SMT will continue to monitor station 716 as a priority and send out notifications via email regarding Barker Slough.

Longfin Smelt:

20mm survey 6 detected no juvenile LFS at any of the stations in the central and south Delta. No LFS larvae or juveniles were detected in areas at high risk of entrainment with the monitoring surveys, and juvenile salvage is continuing to decrease. From 5/30/22 through 6/5/22, 6 juvenile LFS were salvaged at the SWP fish facility and no juvenile LFS were salvaged at the CVP fish facility. Total weekly salvage was 6 juvenile LFS last week, for a total salvage of 7,448 juvenile LFS this season. Water year (WY) 2022 total salvage is much higher than total salvage was in WY2020 or WY2021 and is the highest observed since 2002. LFS larvae (<20mm) were not detected in qualitative larval sampling at either facility this last week, so the SMT has decided to end qualitative larval sampling for the year. Based on no recent larval detections in surveys and salvage it is likely that spawning is at or near the end for the season. Based on

historical trends, spawning ceases by the end of June (Moyle 2002, Wang 1986). The SMT has determined that the overall risk of entrainment is low for sub-adults and adults. No adult or sub-adult LFS have been detected in the central and or south Delta stations since early March, when a sub-adult LFS was caught in the lower San Joaquin River by Enhanced Delta Smelt Monitoring (EDSM) on March 9th.

Section 1-A: Sacramento River and Confluence

Risk of entrainment into the central Delta and export facilities for DS and LFS in Sacramento River (8.1.5.2 C ii, iii, iv)

- Exposure Risk (Hydrology):
 - DS: Low. Water temperatures are approaching the upper thermal limit for spawning, so it is likely that spawning is winding down for the season. DS adults/sub-adults haven't been detected in the lower Sacramento River since March 17th by SKT 3. Entrainment risk is low this week due to minimum exports and low turbidity.
 - LFS: Risk for larvae is low, due to minimum exports. Larval LFS haven't been detected in the Lower Sacramento River since May 16th (EDSM, week 41) however processing is ongoing. See "Routing Risk" for more information on adults and sub-adults.
- Routing Risk (Behavior and life history):
 - DS: Low. Spawning is likely winding down for the season as water temperatures are approaching the upper thermal limit for spawning; additionally, turbidity remains low, and DS are unlikely to move into the central and south Delta.
 - LFS: Low risk of entrainment. Larger juveniles are being detected that have volitional movement. However, with the low turbidity juveniles are unlikely to move into the central and south Delta. Distribution of larval-juvenile LFS may be associated with turbidity according to Mahardja et al. 2017, although other authors did not find a relationship with salvage (Grimaldo et al. 2009). Minimum exports result in a hydrology that potentially limits the movement of juveniles into areas with a higher risk of entrainment, either by entrainment or by negative flows miscuing the larger fish to swim towards the south Delta. Adult detections are declining, and Chipps Island Trawl detected only one juvenile LFS last week on May 31st. Risk remains low as exports will be minimal this week.
- Overall Entrainment Risk:
 - DS: Low.
 - LFS: Low, due to projected operations this week. X2 is currently estimated at approximately 92.4 km. Qwest is near zero and expected to go slightly negative later this week (-200 to -500 cfs).

Section 1-B: Central Delta

Risk of entrainment into the export facilities for DS and LFS in the central Delta (8.1.5.2 D iii, iv, v)

- Exposure Risk (Low, Medium, High):
 - DS:

- Adults and sub-adults: Low. The likelihood of adult and sub-adult DS entrainment remains low, due to no recent detections. Water temperatures are increasing, spawning is winding down.
- Juveniles: Low. Juveniles have been detected in the SDWSC, but none have been detected in the central or south Delta.
- Larvae:
 - Low risk for larva detected in the lower San Joaquin River by SLS Survey 6 (3/22/22), but none have been detected in the lower San Joaquin River by the 20 mm surveys. X2 is currently estimated at approximately 92.4 km, which is lower than the previous week. Qwest is near zero and will become slightly negative (-200 to -500 cfs) this week. Past PTM run results show that at the less negative OMRI expected this week, larvae in the lower San Joaquin River are at low risk of entrainment.
 - High risk for the larva detected at station 902 in the OMR corridor by 20-mm survey 2 (4/5/22). None have been detected in the OMR corridor by the more recent 20mm surveys and there has been no salvage of larval/juvenile DS this year. Past PTM run results show that despite minimum exports and the less negative OMRI expected this week (-1400 to -1900 cfs), any DS larvae that may be in the OMR corridor are at elevated risk of entrainment.
- LFS:
 - Adults and sub-adults: Low risk for adult and sub-adult LFS entrainment. There have been no recent detections of adults or sub-adults in the Central Delta. EDSM collected one sub-adult LFS in the lower San Joaquin River on 3/09/2022, but none have been detected since. Sub-adults/adults may still be present, as they are still being detected at Chipps Island in decreasing numbers. Only one was detected two weeks ago on May 23rd and last week only one juvenile was detected on May 31st. Projected operations being minimum exports creates a low risk of entrainment this week. Adult salvage has been rare in recent years.
 - Larvae and juveniles:
 - Low. No juveniles were detected in the lower San Joaquin River by 20mm 6. X2 is currently estimated at approximately 92.4 km, which is lower than in previous weeks. Qwest is near zero and expected to become slightly negative (-200 to -500 cfs). Past PTM run results show that at the less negative OMRI expected this week (-1400 to -1800 cfs), juveniles in the lower San Joaquin River are at low risk of entrainment.
 - High risk for LFS larvae and juveniles in the OMR corridor. Larvae were not detected in the qualitative larval sampling at either facility this last week. The most recent 20 mm survey 6 did not detect any LFS in the OMR corridor, however a few LFS juveniles were salvaged last week indicating juveniles may still be present. Salvage continued

to decrease this past week with only 6 juveniles salvaged from 5/30/2022 through 6/5/2022. Although higher salvage is expected in dry years, total salvage thus far in 2022 is now much higher than total salvage was for 2020 and 2021, also dry and critically dry years respectively. Salvage of juvenile LFS is decreasing and includes larger sized juveniles that can volitionally swim downstream. However, despite minimum exports, negative flows in the OMR corridor may miscue these fish to swim towards the export facilities instead of downstream.

- Change in exposure from previous week: (Note: The change in risk compared to previous weeks is not required by the Incidental Take Permit [ITP]).
 - DS: Risk remains low in the lower San Joaquin River due to minimum exports this week. However, a larval DS was detected at 902 in the OMR corridor by 20mm survey 2 (4/5/22) and any larval DS that may still be in the OMR corridor are at high risk of entrainment.
 - LFS: Risk is declining as detections in monitoring surveys and salvage has decreased but remains moderate as there may still be some LFS in the OMR corridor at low densities. Warmer weather is expected later this week and as water temperatures increase, LFS still in the OMR corridor will either swim downstream or possibly be miscued by negative flows in the OMR corridor and swim towards the export facilities. 20-mm 6 detected no larval or juvenile LFS in the lower San Joaquin River and none in the central and south Delta. Juvenile LFS salvage has been decreasing over the last several weeks, and this decrease is expected to continue as water temperatures are approaching upper thermal limit for LFS survival.
- Reporting OMRI (Number and range of OMRI bins will vary based on anticipated hydrology and operations)
 - The SMT has determined that risk of entrainment is low for adult and sub-adult DS across the range of expected OMRI values. 20-mm 2 detected one larval DS at station 902 in the lower San Joaquin River on 4-5-22, with the rest of the detections in the Lower Sacramento River and the North Delta. The less negative OMRI expected this week decreases risk of entrainment into the OMR corridor and water projects from the lower San Joaquin River. Despite the less negative OMRI expected this week (-1,400 to -1,900 cfs), larval DS that may be in the OMR corridor are at high risk of entrainment.
 - The SMT determined that risk of entrainment is low for adult and sub-adult LFS, low for LFS larvae and juveniles in the lower San Joaquin River, and moderate for LFS larvae and juveniles in the OMR corridor at the less negative OMRI (-1,400 to -1,900 cfs) expected this week.

Section 2: Basis for Advice

The 2020 ITP ([Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00](#)) states that advice to WOMT shall be based on the following Conditions of Approval:

List relevant Condition of Approval number and title based on species/life stage, time of year, etc.

8.3.1 Integrated Early Winter Pulse Protection. Between December 1 and January 31 each year Permittee shall reduce south Delta exports for 14 consecutive days to maintain a 14-day average OMRI no more negative than -2,000 cfs, and convene the SMT within one day of triggering the following criteria:

- Three-day running average daily flows at Freeport greater than, or equal to, 25,000 cfs, AND
- Three-day running average of daily turbidity at Freeport greater than, or equal to, 50 Nephelometric Turbidity Units (NTU), OR
- The SMT determines that real-time monitoring of abiotic and biotic factors indicates a high risk of DS migration and dispersal into areas at high risk of future entrainment.

After maintaining a 14-day average OMRI no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMRI no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

The Integrated Early Winter Pulse Protection Action may only be initiated once during the December 1 through January 31 time period each year.

8.3.3 Adult Longfin Smelt Entrainment Protection. After December 1, if an Integrated Early Winter Pulse Protection (Condition of Approval 8.3.1) has not yet initiated, Permittee shall reduce south Delta exports to maintain a 14-day average OMRI no more negative than -5,000 cfs and initiate OMR Management (Condition of Approval 8.3) if:

- Cumulative combined LFS salvage (total estimated LFS counts at the CVP and SWP salvage facilities beginning December 1 through February 28 exceeds the most recent Fall Midwater Trawl (FMWT) LFS index¹ divided by 10, OR

¹ The Fall Midwater Trawl (FMWT) Survey annual abundance index for LFS is calculated as the sum of September through December monthly abundance indices and is typically reported at about the same date as adult salvage begins in December. The FMWT Index available beginning on December 1 each year shall be used to establish this threshold.

- Real-time monitoring of abiotic and biotic factors indicates a high risk of LFS movement into areas at high risk of future entrainment, as determined by DWR and CDFW SMT staff.

When evaluating the possibility of LFS movement into areas that may be subject to an elevated risk of entrainment, the SMT shall evaluate catch of LFS with fork length ≥ 60 mm by the Chipps Island Trawl (conducted by USFWS) as an early warning indicator for LFS migration movement into the Delta, in addition to other available survey and abiotic data. The SMT shall communicate the results of these risk assessments and advice to the WOMT (Condition of Approval 8.1.3), and operational decisions shall be made as described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

8.4.1 OMR Management for Adult Longfin Smelt. From the onset of OMR Management (Condition of Approval 8.3) through February 28, the SMT shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.1.5.2) and decide whether to recommend an OMR flow requirement between -5,000 cfs and -1,250 cfs to minimize entrainment and take of adult LFS. The SMT may provide advice to restrict south Delta exports for seven consecutive days to achieve a seven-day average OMRI within three risk categories:

- Low risk: OMR between -4,000 cfs to -5,000 cfs
- Medium risk: OMR between -2,500 cfs to -4,000 cfs
- High risk: OMR between -1,250 cfs to -2,500 cfs

If a risk assessment conducted by the SMT determines that a more restrictive OMR flow requirement is needed to minimize take of adult LFS, the SMT shall provide its advice to WOMT (Condition of Approval 8.1.3) and operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

This Condition will terminate when a high-flow off-ramp occurs (Condition of Approval 8.4.3), or when LFS spawning has been detected in the system, as determined by the SMT, or, if there is disagreement and resolution is not reached within WOMT, as determined by CDFW. The SMT shall consider results from Additional LFS Larval Sampling (Condition of Approval 7.6.1) to inform its assessment of the start of LFS spawning. After LFS spawning has been observed, Permittee shall implement Condition of Approval 8.4.2 to minimize take of larval and juvenile LFS.

8.4.2 Larval and Juvenile Longfin Smelt Entrainment Protection. From January 1 through June 30, when a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period exceeds one of the following thresholds:

- LFS larvae or juveniles found in four or more of the 12 SLS or 20 mm stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919), or

- LFS catch per tow exceeds five LFS larvae or juveniles in two or more of the 12 stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919).

Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Permittee shall also immediately convene the SMT to conduct a risk assessment (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities, determine if an OMR flow restriction is warranted, and recommend an OMR flow limit between -1,250 and -5,000 cfs. The SMT risk assessment and operational advice shall be reviewed by the WOMT (Condition of Approval 8.1.3) via the Collaborative Real-time Decision-making process (Condition of Approval 8.1.4). Permittee shall operate to the export restriction and OMR flow target approved through Conditions of Approval 8.1.3 and 8.1.4. Each week the SMT shall convene to conduct a new risk assessment and determine whether to maintain, or off ramp from, export restrictions based on the risk to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

From January 1 through June 30, DWR and CDFW SMT staff shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities. As a part of the risk assessment the SMT shall provide advice on the appropriate OMR flow targets to minimize LFS entrainment or entrainment risk, or both. The SMT shall provide its advice to WOMT (Condition of Approval 8.1.3) and use the Collaborative Approach to Real-time Risk Assessment process described in Condition of Approval 8.1.4 to determine if an OMR flow restriction is warranted and determine OMR flow limit between -1,250 and -5,000 cfs. The OMR flow limit shall be in place until the next risk assessment conducted by the SMT determines that it is no longer necessary to minimize take or related impacts to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

8.4.3 High Flow Off-Ramp from Longfin Smelt OMR Restrictions. OMR management for adult, juvenile, or larval LFS as described in Conditions of Approval 8.4.1 and 8.4.2 are not required, or would cease if previously required, when river flows are (a) greater than 55,000 cfs in the Sacramento River at Rio Vista or (b) greater than 8,000 cfs in the San Joaquin River at Vernalis. If flows subsequently drop below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, the OMR limit previously required as a part of Conditions of Approval 8.4.1 and 8.4.2 shall resume.

8.5.1 Turbidity Bridge Avoidance. The purpose of this Condition is to minimize the risk of entrainment of adult DS in the corridors of the Old and Middle rivers into the south Delta export facilities. This Condition is intended to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the south Delta export facilities, which historically has been associated with elevated salvage of pre-spawning adult DS.

After the Integrated Early Winter Pulse Protection (Condition of Approval 8.1.3) or February 1 (whichever comes first), until April 1, Permittee shall manage exports to maintain daily average

turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. If the daily average turbidity at OBI is greater than 12 NTU, Permittee shall restrict south Delta exports to achieve an OMR flow that is no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 NTU.

If, after five consecutive days of OMR flow that is less negative than -2,000 cfs and the daily average turbidity at OBI is not less than 12 NTU, the SMT may convene to assess the risk of entrainment of DS (Condition of Approval 8.1.5.2). The SMT may provide advice to WOMET regarding changes in operations that could be conducted to minimize the risk of entrainment of DS (Condition of Approval 8.1.3). The SMT may also determine that OMR restrictions to manage turbidity are infeasible and may instead provide advice for a different OMR flow target that is between -2,000 and -5,000 cfs and is protective based on turbidity and adult DS distribution and salvage to the WOMET for consideration (Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).

Turbidity readings at individual sensors can generate spurious results in real time. Spurious results could be incorrectly interpreted as a turbidity bridge, when in fact the cause is a result of local conditions or sensor error. To assess whether turbidity readings at OBI are attributable to a sensor error or a localized turbidity spike, Permittee, in coordination with Reclamation, may consider and review data from other nearby locations and sources. Additional information that will be reviewed include regional visualizations of turbidity, alternative sensors, and boat-based turbidity mapping, particularly if there was evidence of a local sensor error. Permittee may bring data from these additional sources to the SMT for consideration during the development of a risk assessment to be provided to the WOMET for evaluation (Condition of Approval 8.1.3).

Permittee shall use the decision-making process described in Condition of Approval 8.1.4 (Collaborative Real-time Risk Assessment) to determine if south Delta exports may increase after five days of OMR no more negative than -2,000 cfs, or to determine that this action is not warranted due to a sensor error or localized turbidity event. Permittee shall implement this action until CDFW is in agreement that the action may be ended or modified.

8.5.2 Larval and Juvenile Delta Smelt Protection. If the five-day cumulative salvage of juvenile DS at the CVP and SWP facilities is greater than or equal to one plus the average prior three years' FMWT index (rounded down), Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Additionally, if the five-day cumulative salvage threshold is met or exceeded, Permittee shall immediately convene the SMT to conduct a risk assessment (Condition of Approval 8.1.5.2) and determine the future risk of entrainment and take of larval and juvenile DS. The SMT may provide advice to further restrict south Delta exports to maintain a more positive OMR than -5,000 cfs. The SMT may provide advice for further restrictions within three risk categories:

- Low risk: Limit OMR between -4,000 cfs to -5,000 cfs
- Medium risk: Limit OMR between -2,500 cfs to -4,000 cfs

- High risk: Limit OMR between -1,250 cfs to -2,500 cfs

The duration and magnitude of operational advice shall be provided to the WOMT (Condition of Approval 8.1.3) and decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). When conducting risk assessments to evaluate the risk of entrainment and take of juvenile DS, the SMT shall evaluate the following information sources, in addition to any other models or surveys they deem appropriate and those listed in Condition of Approval 8.1.5.2:

- Results from a CDFW approved DS life cycle model.
- DS recruitment levels identified by the SMT using the CDFW- approved life cycle model that links environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval DS in June per number of spawning adults in the prior February-March period.
- Hydrodynamic models and forecasts of entrainment informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile DS that could be entrained.

If expanded salvage at the CVP and SWP facilities of juvenile DS exceeds 11 within a three-day period under this condition, Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -3,500 cfs. If juvenile DS continue to be salvaged at the CVP and SWP facilities during the seven days of OMR restrictions, then Permittee shall continue restrictions and request a risk assessment by the SMT to determine if additional advice and subsequent restrictions are warranted and provide advice to WOMT (see Condition of Approval 8.1.3) and follow the decision-making process described in Condition of Approval 8.1.4.

8.12 Barker Slough Pumping Plant Longfin and Delta Smelt Protection. Permittee shall operate the BSPP to protect larval LFS from January 15 through March 31 of dry and critical water years. Permittee shall operate to protect larval DS from March 1 through June 30 of dry and critical years. If the water year type changes after January 1 to below normal, above normal or wet, this action will be suspended. If the water year type changes after January to dry or critical, Permittee shall operate according to this Condition of Approval.

From January 15 through March 31 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval LFS are detected at Station 716. In addition, in its weekly meetings from January 15 through March 31, the SMT shall review LFS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval LFS at the BSPP. When recommended by the SMT, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP according to the advice provided by the SMT.

From March 1 through June 30 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval DS are

detected at Station 716. In addition, in its weekly meetings from March 1 through June 30, the SMT shall review DS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval DS at the BSPP (including temperature and turbidity). When recommended by the SMT, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs.

The DS requirements described in this condition may be adjusted to align with USFWS requirements to minimize take of DS through an amendment to this ITP.

8.13 Water Year Type Definition. All references to water year type in this ITP shall be defined based on the Sacramento Valley Index (SVI) unless otherwise noted.

Additionally, ITP COA 3.8 Describes the Minimum Export Rate: As described in Permittee's December 2019 ITP application (page 3-56), in order to meet health and safety needs, critical refuge supplies, and obligations to senior water rights holders, the combined CVP and SWP export rates at Jones Pumping Plant and Banks Pumping Plant will not be required to drop below 1,500 cfs and SWP exports will not be required to drop below 600 cfs.

Discussion of Conditions of Approval

Provide discussion addressing criteria for each Condition of Approval listed in "Basis for Advice" section. Refer to data below where appropriate.

COAs relevant to initiating OMR management went into effect December 1st. The SMT conducted a Risk Assessment based on COA 8.1.5.2.

8.3.1: This COA was triggered by conditions measured on 12/17/2021 when the running three-day average of daily flow and turbidity reached 27,152 cfs and 66.79 FNU respectively. Operations were reduced on 12/20/2021 targeting a 14-day average OMR index no more negative than -2,000 cfs for 14 consecutive days. After maintaining a 14-day average OMRI no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMRI no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

8.3.3: This COA is no longer active due to the initiation of an Integrated Early Winter Pulse Protection (COA 8.3.1).

8.4.1: This COA is no longer active due to the detection of larval LFS by SLS.

8.4.2: This COA went into effect on 1/03/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1).

- SLS 1 was initially canceled due to COVID mitigation, however, the 12 south and central Delta stations listed in this COA were sampled on 1/18/2022. The resulting data triggered this COA by detection of larval LFS at more than four

stations (809, 812, 815, 901, 906, and 910) and larval catch exceeded 5 fish per tow at two stations (809 and 812).

- Data collected by SLS 2 triggered this action for the second time this season on 1/31/2022. Larval LFS were detected at four of the relevant stations (809, 812, 815 and 906) and catch per tow exceeded five LFS at two stations (809 and 812). The SMT did not advise a less negative OMR Index under this COA due to reduced exports.
- Data collected by SLS 3 did not trigger this COA.
- Data collected by SLS 4 triggered this action for the third time this season on 2/28/2022. Larval LFS were detected at five of the relevant stations (809, 812, 901, 902, and 915) and catch per tow exceeded five LFS at three stations (809, 812, and 901). However, the SMT did not advise a less negative OMRI under this COA due to low exports and positive Qwest. On March 8th the SMT requested a PTM run to help inform risk for larvae and determine if the fate of particles in the lower San Joaquin River and the central and south Delta would change if a recommendation to limit OMR was made. The injection points selected were at stations 812, 815, and 902. The scenarios modeled compared planned exports (-3000 cfs for a couple of days slowly ramping down to -1,400 cfs) with a recommendation to limit OMR to -1,250 cfs.
- Data collected by SLS 5 triggered this action for the fourth time this season on 3/11/2022. Larval LFS were detected at four of the relevant stations (809, 812, 815, and 901). Of the 21 larvae detected, 12 had yolk sacs indicating spawning is ongoing. On March 11th the SMT met to discuss the results of the PTM run and evaluate survey and salvage data. The PTM results show that with a more negative OMRI of -3,000 cfs as with the base case scenario 43% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. Whereas the -1,250 cfs scenario showed 31% of particles are entrained into the facilities and into the OMR corridor after 3 weeks. This shows that at the more negative OMRI scenario (base case) there is an increased risk to larvae and juveniles in the OMR corridor, and this difference in particles entrained under different scenarios is consistent with prior years when recommendations to limit OMR were made. The SMT met on 3/15/2022 and continued the recommendation that was made on 3/11/2022 to limit OMRI to no more negative than -1,250 cfs for the protection of juvenile LFS. The SMT met on 3/22/2022 and discussed OMRI was expected to temporarily become as negative as -2,500 cfs on the 25th, however new PTM run results discussed showed very little to no difference in particles entrained into the OMR corridor and the projects between a -1,250 cfs recommendation and an OMRI temporarily as negative as -2,000 cfs. Therefore, the SMT decided not to continue the recommendation from 3/11/2022 and 3/15/2022.
- Data collected by SLS 6 and 20mm survey 1 triggered this action for the fifth time this season on 3/29/2022. SLS 6 detected 34 LFS larvae at 5 of the 11 stations processed so far in the central and south Delta (see table 1 in attachments), and densities were higher than those detected by SLS 5 earlier in March. Some of the

larvae detected by SLS 6 in the central and south Delta still had yolk-sacs. 20mm survey 1 detected 71 LFS larvae at 5 of the 6 stations processed so far in the central and south Delta (see table 2 in attachments). On March 29th the SMT met to discuss the results of the PTM run and evaluate survey and salvage data. After 3 weeks, the PTM run results show that 10% of the particles at 815 (lower San Joaquin River) were entrained into the OMR corridor and projects at the -5,000 cfs scenario, whereas 5% were entrained into the OMR corridor and projects at the -1,250 cfs scenario. PTM results also show that at station 902 with a more negative OMRI of -5,000 cfs as with the base case scenario, 63% of particles are entrained into the projects and into the OMR corridor after 3 weeks (27% to the projects, 36% into the OMR corridor). Whereas the -1,250 cfs scenario, showed 55% of particles entrained into the facilities and into the OMR corridor after 3 weeks (12% to the projects, 43% into the OMR corridor). This shows that a recommendation of -1,250 cfs on a 7-day average will help decrease risk of entrainment of LFS larvae and juveniles in the OMR corridor, particularly entrainment to the projects, under these two scenarios. Juvenile LFS salvage is increasing and expected to peak in April and May, this recommendation is made to help decrease the risk of higher salvage this year. The SMT continued this recommendation on 4/5/2022.

- Data collected by 20mm 2 triggered this COA for the 6th time this season on 4/11/2022. The SMT continued the -1,250 cfs recommendation on 4/12/2022 and on 4/19/2022. These recommendations were based on continued larval and juvenile LFS presence in the central and south Delta and continued LFS juvenile salvage.
- Data collected by 20mm survey 3 triggered this COA for the 7th time this season on 4/26/2022. The SMT continued the -1,250 cfs recommendation for the protection of larval and juvenile LFS. This recommendation was based on continued presence of larval and juvenile LFS in the central and south Delta and the sharp increase in LFS juvenile salvage over the previous week. On 5/3/2022 the SMT continued the -1,250 cfs recommendation for the protection of larval and juvenile LFS. This recommendation is based on continued presence of larval and juvenile LFS in the central and south Delta and continued elevated salvage of juvenile LFS over the past week.
- Data collected by 20mm survey 4 did not trigger this COA and on May 10th, the previous recommendation was lifted by the SMT.
- Data collected by 20mm surveys 5 and 6 did not trigger this COA.

8.5.1: This COA went into effect on 1/3/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1). Current OBI turbidity levels are below the threshold.

8.5.2: The 2021 FMWT Annual Index for DS is zero for the fourth consecutive year. The salvage threshold is one Juvenile DS. No juvenile DS have been salvaged this water year. One cultured subadult DS (fork length = 54 mm, adipose fin clipped) was salvaged on 1/16/2022.

8.12: This COA became active on 2/8/2022 when the Sacramento Valley Water Year Type Index (SVI) February Forecast was released. The forecasted value of 6.2 (50% exceedance) is within the range for a dry water year. SLS 2 detected larvae at station 716, however, this COA was not active at the time based on the January SVI. SLS 3 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 2/14/2022, triggering this COA for the first time this season thereby limiting BSPP maximum diversion rate to no more than 60 cfs on a 7-day average. SLS 4 did not detect LFS or DS larvae at station 716, therefore this COA was not triggered thereby removing the limitation on BSPP of no more than 60 cfs exports on a 7-day average that was previously triggered by SLS 3. SLS 5 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 3/11/2022, triggering this COA for the second time this season. 20-mm survey 1 detected 5 larval DS on 3/21/2022, triggering this COA for the third time this season. BSPP LFS protections off-ramped March 31st. An amendment to this COA was approved on April 1st that allows the permittee to meet and confer with CDFW in the event this COA is triggered to determine if a higher maximum export rate than 60 cfs is needed for health and safety. 20-mm 2 did not detect DS at 716, so this COA was not triggered thereby removing the limitation on BSPP of no more than 60 cfs exports on a 7-day average on April 11th that was previously triggered by 20mm 1. 20mm surveys 3, 4, 5, and 6 did not detect DS at station 716, so this COA was not triggered.

8.13: The SVI February forecast corresponding to the 50% probability of exceedance is 6.2 which is in the range for a Dry water year classification. The forecast was reported on the California Data Exchange Center (CDEC) [Water Supply Index Webpage](#), accessed on 2/8/2022. The updated March SVI forecast was released on 3/8/2022 is 4.8 (50% exceedance) within the range for a critically dry water year. The updated April SVI forecast was 4.2 (50% exceedance) within the range for a critically dry water year.

Section 3: Hydrology and Operations Assessment of hydrologic, operational, and meteorological information. 8.1.5.2 A.

Section 3-A: Water operations conditions. 8.1.5.2.A. i

- Antecedent Actions: *(e.g. Delta Cross Channel [DCC] gate closure and actions such as integrated early winter pulse protection, etc.)*
 - OMR Management was initiated on 1/3/2022 following the 14-day Integrated Early Warning Pulse Protection action (COA 8.3.1).
 - COA 8.3.1 was triggered by conditions measured on 12/17/2021. Exports were reduced to comply with this COA on 12/20/2021 through 1/2/2022.
 - DCC gates closed on 11/30/2021. Opened on May 27th and closed again on May 31st.
 - The Emergency Drought barrier at False River reconstruction was completed on 4/13/2022.
 - The Old River and Middle River Agricultural Barriers installations are now complete. Grant Line Canal Agricultural Barrier installation was completed yesterday June 6th.

- Controlling Factors: Combined exports are targeting a Net Delta Outflow Index (NDOI) of 4,000 cfs, combined exports are limited to 1,500 cfs when NDOI is below 7,100 cfs for April through June per the TUCO ([link to TUCO](#)).
- Water Temperature:
 - Clifton Court Forebay (CCF) Daily Average Water Temperature = 22.3°C, 0 days > 25°C
 - 3 Station Average = 21.29°C
- Tidal Cycle: Peak of moderate neap tide, anticipating stronger spring tide that will peak mid-month and cause challenges with meeting Delta salinity requirements. Releases increased to proactively help address salinity challenges.
- Turbidity:
 - 8.3.1 Freeport 3-day average = NA
 - 8.5.1 OBI Turbidity Daily Average = 2.88 FNU.
- Salinity: X2 is > 81 km. Estimated at 92.4 km.
- Hydrologic Footprint: Past PTM runs were used to inform the hydrologic footprint of the less negative OMRI expected this week.

Section 3-B: Water operations outlook. 8.1.5.2.A. ii

- Outages:
 - State Water Project (SWP): None
 - Central Valley Project (CVP): None
- Exports: Combined exports limited to 1,500 cfs when NDOI is below 7,100 cfs for April through June per the TUCO. Outlook reflects maximum combined exports of up to 1,600 cfs to include Byron Bethany Irrigation District diversions.
 - SWP: 300 to 700 cfs
 - CVP: 800 to 900 cfs

Meteorological Forecast: No significant precipitation is in the forecast.

Section 3-C: Projected conditions. 8.1.5.2.A. iii

- Warm and dry conditions, no precipitation expected this week.
- DCC Gates position: Opened May 27th and closed again on May 31st. Currently planning to keep closed due to salinity concerns, operators will monitor and notify us if that changes.
- Sacramento River flow at Freeport 8,200 cfs.
- San Joaquin River flow at Vernalis 770 cfs yesterday.
- Qwest: Zero yesterday with rain effect, will stay near zero until later in the week then will be in the -200 to -500 cfs range.
- Expected changes in South Delta Exports: No changes, minimum exports expected.
- NDOI: 5,100 cfs yesterday.
- Upstream releases:
 - Keswick = 4,000 cfs
 - Nimbus = 2,000 cfs

- Goodwin = 800 cfs to meet D-1641 Vernalis flow requirements.
- Oroville = 3,000 cfs and will increase up to 3,500 cfs later this week.

Table 1: Comparison of OMR and OMR Index (all values from [SacPAS website](#), accessed 6/7/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
6/4/2022	Daily	-165 cfs	-1,420 cfs
6/4/2022	5-day	-1,550 cfs	-1,420 cfs
6/4/2022	14-day	-1,920 cfs	-1,580 cfs

Section 4: Distribution and Biology.

8.1.5.2.B. Assessment of biological information for Delta Smelt and Longfin Smelt

Section 4-A: Delta Smelt population status 8.1.5.2.B. i

- The last marked adult DS detection occurred on 4/14/2022 in Suisun Marsh (n=1), another was caught on 4/13/2022 in the SDWSC, both were pre-spawn males. The last wild adult DS detection occurred on 1/5/2022 in the lower Sacramento River stratum. Larval fish haven't been detected in surveys since April 7th but may still be present at low densities. Water temperatures are increasing and approaching the thermal maximum at which spawning is expected, so spawning is likely winding down for the season. Several juveniles were detected and confirmed by EDSM in the last few weeks in the SDWSC.
- Spring Kodiak Trawl: SKT 5 was on the water from 5/9/2022 through 5/12/2022, this was the final survey for this season. No DS were detected.
- 20mm: Survey 6 was on the water from 5/31/2022 through 6/3/2022, processing is ongoing and so far, no DS have been detected. Preliminary data is in table 1 of the attachments. Surveys 4 and 5 processing is ongoing, but so far also have not detected any DS. Preliminary data from Survey 5 is in table 2 of the attachments. The 20mm season total for DS is now 9.
- EDSM: From 5/29/2022 through 6/4/2022 EDSM completed sampling at 29 sites. Several sites, including all sites falling within the Suisun Marsh and Lower San Joaquin strata, were cancelled due to boat issues or wind. Currently there is minimal catch data to report for last week, but it is included along with effort and sample processing status in table 3 in attachments. Processing is ongoing and data is preliminary. The four juvenile DS preliminarily identified reported last week from the SDWSC on May 23rd (26-38mm FL) were determined not to be DS through the QA/QC process. One new DS was confirmed from May 23rd in the SDWSC FL=25.5mm. The total EDSM DS count for the Phase 2 season is now 16 confirmed. Preliminary data for each week of phase 2 is summarized in table 3 in attachments. So far, the most recent postlarval/juvenile abundance estimate for the week of May 23rd-26th was 3,366, however processing is ongoing.

- Chipps: From 5/29/2022 through 6/4/2022 Chipps Island Trawl completed all 30 of the scheduled tows and collected no DS. See Table 4 in attachments for details.
- Bay Study: Survey 5 sampling is complete, and no DS were detected.
- Salvage: No DS have been salvaged at either facility in the past seven days and no larvae have been detected in qualitative sampling. The SMT agreed to stop qualitative larval sampling at the fish facilities as of today, due to no recent detections of larvae at the facilities or in monitoring surveys.
- FMWT Index for DS = 0
- DS life cycle model (LCM) discussion: NA
- Biological Conditions: Water temperatures are approaching the upper thermal range limit that is conducive to spawning as reported in Damon et al. (2016), larval fish have not been detected since April 7th, but may still be present at low densities. Spawning is likely to be winding down for the season.
- % of population in Delta zones: NA

Section 4-B: Longfin Smelt population status 8.1.5.2.B. ii.

- FMWT Index for LFS = 323
- Spring Kodiak Trawl: SKT 5 was on the water from 5/9/2022 through 5/12/2022, this was the final survey for this season. 92 LFS were detected; four were caught in the lower Sacramento River, 31 were caught in Suisun Bay, and 57 were caught in Suisun Marsh.
- 20mm: Survey 6 was on the water from 5/31/2022 through 6/3/2022, processing is ongoing and so far, one LFS has been detected in the confluence. Preliminary data is in table 1 of the attachments. Survey 5 was on the water from 5/16/2022 through 5/19/2022, processing is ongoing and so far, LFS were detected in the lower San Joaquin River, the lower Sacramento River, the confluence, Suisun Bay and Suisun Marsh. Preliminary data is in table 2 in attachments.
- EDSM: From 5/29/2022 through 6/4/2022 EDSM completed sampling at 29 sites. Several sites, including all sites falling within the Suisun Marsh and Lower San Joaquin strata, were cancelled due to boat issues or wind. Currently there is minimal catch data to report for last week, but it is included along with effort and sample processing status in table 3 in attachments. So far larval and juvenile LFS were detected in Suisun Bay, Suisun Marsh, and the lower Sacramento River in recent weeks.
- Chipps: From 5/29/2022 through 6/4/2022 Chipps Island Trawl completed all 30 of the scheduled tows and collected only one juvenile LFS (FL= 31mm). See Table 4 in attachments for details.
- Bay Study: The May Bay Study survey is now complete. They caught 184 LFS, including 166 juveniles and 18 adults. Most fish were caught in Suisun Bay, but LFS were caught from the lower Sacramento River down to Central and South Bay. Anecdotally the adult LFS in Suisun were very fat and healthy looking.
- LEPS sampling with the 20mm net ended May 12th and sample processing is ongoing, however final data will not be available until later this. Larval LFS were detected at low densities as of sampling conducted on 2/25/2022. No yolk sac larvae were present as of

February 25th. An additional larva (FL=10mm) was reported from the March 18th LEPS samples from the SLS gear.

- Salvage: From 5/30/22 through 6/5/22, 6 juvenile LFS were salvaged at the SWP fish facility and none were salvaged at the CVP fish facility. Total weekly salvage was 6 juvenile LFS for a total salvage of 7,448 juvenile LFS this season. This is much higher than total salvage was in WY2020 or WY2021 and the highest salvage observed since 2002.
- Qualitative larval sampling began at both facilities on February 7th and LFS larvae were not detected at either facility this week. The SMT agreed to stop qualitative larval sampling at the fish facilities as of today, due to no recent detections of larvae at the facilities or in monitoring surveys.

Section 4-C: Additional data sources to assess sensitivity to entrainment Delta.8.1.5.2.C & D. i

Notes:

- There is an herbicide treatment planned in CCF on June 28, 2022, that will cause an outage. Clifton Court radial gates will resume operation within a couple of days of the treatment, however Banks will not resume normal pumping operations for three to four days while the herbicide takes effect.
- Summer Towntnet Survey is out on the water this week for their first survey of the season. 20mm survey 7 will be on the water next week. The last 20mm survey for the season is survey 9 and will be on the water July 11th-14th.
- The SMT discussed qualitative larval sampling at the facilities. With no detections of LFS larvae in several weeks and no detections of DS larvae this season, the SMT agreed that qualitative larval sampling end for the season. Fish facility staff have reported that in the last week thousands of striped bass in the 20mm range are being found in the larval samples, making processing of larval samples extremely slow and tedious. As larval sampling at the facilities continues in future years, subsampling will need to be considered this time of year to expedite processing. Some species of interest like DS are at very low abundance while other species like striped bass are very abundant, so this will need to be considered for continuing to develop methods for larval sampling at the facilities.
- The SMT discussed that with juvenile DS only being detected in the SDWSC in recent weeks, we don't know if this is due to higher catch efficiency in the SDWSC or if DS are more abundant in this area. This could be a possible topic for further discussion in the off-season.
- The SMT brainstormed possible topics of interest for post and preseason workshops and added a couple of topics to the list, including a preseason salvage tutorial and further post season discussions of the new larval smelt entrainment model introduced by DWR last week. CDFW will look back at post season topics from last year that weren't addressed and the SMT can discuss if we want to revisit any of those topics this year. K&W will look at how the prioritization was determined last year for topics and SMT can discuss if the same method should be used for prioritization this year.

Literature cited:

Damon, L. J., S. B. Slater, R. D. Baxter, and R. W. Fujimura. 2016. Fecundity and reproductive potential of wild female Delta smelt in the upper San Francisco Estuary, California. *California Fish and Game* 102(4):188–210.

Grimaldo L. F., Sommer T., Van Ark N., Jones G., Holland E., Moyle P.B., Herbold B., Smith P. 2009. Factors affecting fish entrainment into massive water diversions in a tidal freshwater estuary: can fish losses be managed? *North American Journal of Fisheries Management* 29:1253-1270.

Mahardja B, Young J, Schreier B, Sommer T. 2017. Understanding imperfect detection in a San Francisco Estuary long-term larval and juvenile fish monitoring program. *Fish Manag Ecol* 24:488–503.

Moyle, P. 2002. *Inland Fishes of California: revised and expanded*. University of California Press.

Wang, J.C. 1986. *Fishes of the Sacramento-San Joaquin Estuary and Adjacent Waters, California: A Guide to the Early Life Histories*. Interagency Ecological Program Technical Report No. 9. Reprinted in 2010 by the U.S. Bureau of Reclamation.

Attachments: Table 1: 20mm survey 6 Catch Table, Figure 1. 20mm Sampling Locations, Table 2: 20mm survey 5 Catch Table, Table 3: EDSM Catch Table, Table 4: Chippis Island Catch Table.

Table 1. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 6, which was in the field 5/31/2022 – 6/3/2022. These data are preliminary and subject to change. Reduced tow times of 2.5 minutes indicated with **. Processing complete through 6/6/2022.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	6	323	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	340	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	342	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	343	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	344	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	345	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	346	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	405	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	411	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	418	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	6	501	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	504	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	519	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	602	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	606	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	609	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	610	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	6	508	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	6	513	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	6	520	NA	0	Not Yet Processed	NA	NA	NA	NA	Confluence
2022	6	801	31-May-22	3	Longfin Smelt	1	30	30	30.0	Confluence
2022	6	804	01-Jun-22	3	No Smelt Catch	0	NA	NA	NA	Confluence
2022	6	703	01-Jun-22	1	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	6	704	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	705	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	706	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	707	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	711	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	712	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	716	03-Jun-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	6	718	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	719	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	720	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	723	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	724	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	726	NA	0	Not Yet Processed	NA	NA	NA	NA	Sac. River System
2022	6	809	01-Jun-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	812	01-Jun-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	6	815	01-Jun-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	901**	31-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	902	31-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	906	01-Jun-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	910	31-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	912	31-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	914	31-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	915	31-May-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	918	31-May-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	6	919	01-Jun-22	0	No Smelt Catch	0	NA	NA	NA	Central & South Delta

Figure 1. 20mm sampling locations.

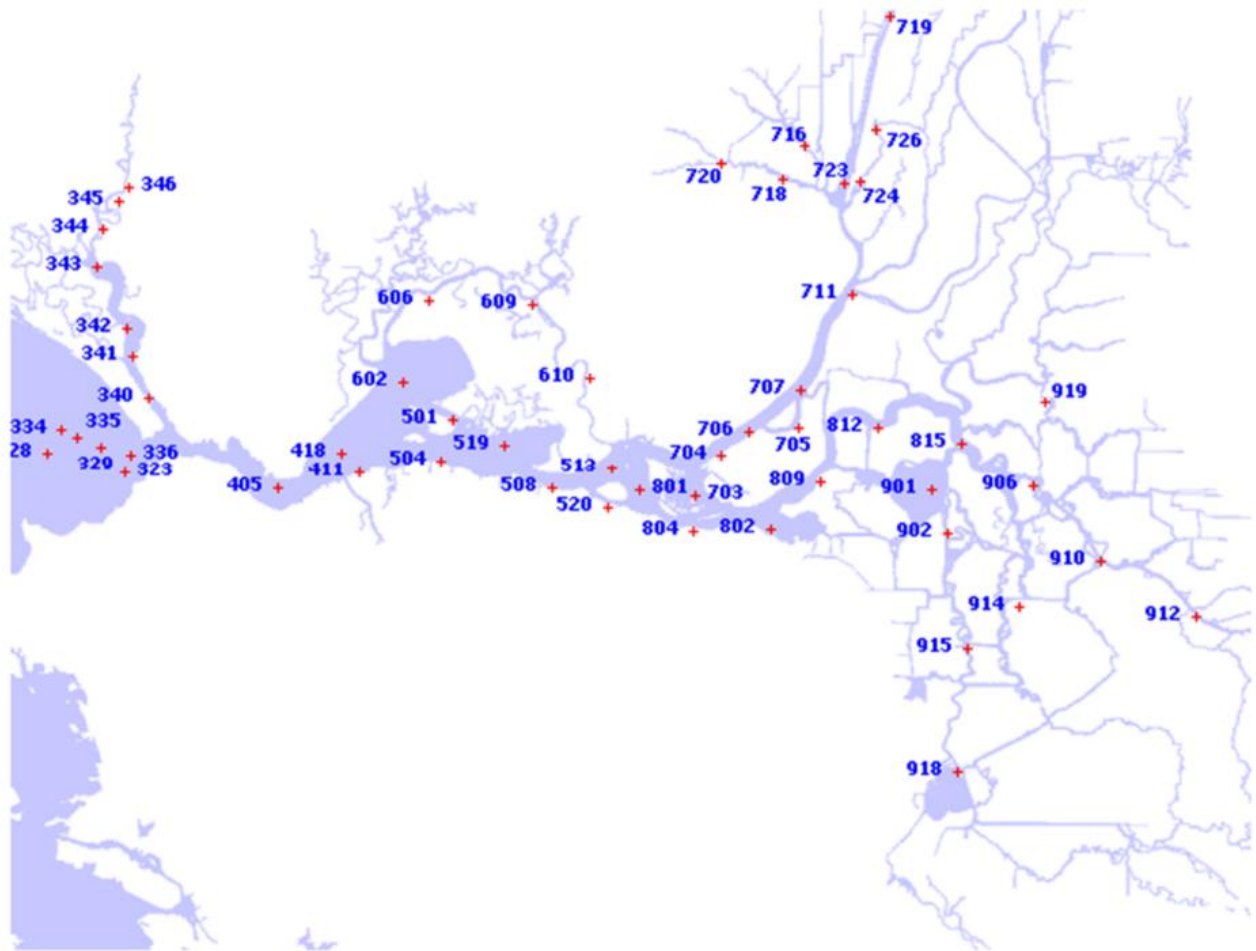


Table 2. Delta Smelt and Longfin Smelt catch per station from 2022 20-mm Survey 5, which was in the field 5/16/2022 – 5/19/2022. These data are preliminary and subject to change. Reduced tow times of 5 minutes indicated with *. Reduced tow times of 2.5 minutes indicated with **. Stations with dropped tows indicated with ***. Processing complete through 6/6/2022.

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	5	323	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	340	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	342	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	343	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	344	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	345	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	346	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	405	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	411	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	418	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	501	18-May-22	3	Longfin Smelt	52	21	41	32.5	Suisun Bay & West
2022	5	504	18-May-22	3	Longfin Smelt	1	36	36	36.0	Suisun Bay & West
2022	5	519	18-May-22	3	Longfin Smelt	4	26	35	32.8	Suisun Bay & West
2022	5	602**	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	606**	NA	0	Not Yet Processed	NA	NA	NA	NA	Suisun Bay & West
2022	5	609*	18-May-22	3	Longfin Smelt	70	23	41	NA	Suisun Bay & West
2022	5	610	18-May-22	3	Longfin Smelt	2	26	29	27.5	Suisun Bay & West
2022	5	508	18-May-22	3	Longfin Smelt	27	25	40	31.6	Confluence
2022	5	513	18-May-22	3	Longfin Smelt	18	26	93	34.4	Confluence
2022	5	520	18-May-22	3	Longfin Smelt	20	21	32	26.3	Confluence
2022	5	801	16-May-22	3	Longfin Smelt	40	24	37	29.1	Confluence
2022	5	804	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Confluence
2022	5	703	17-May-22	3	Longfin Smelt	2	25	27	26.0	Sac. River System
2022	5	704*	16-May-22	3	Longfin Smelt	94	22	36	28.9	Sac. River System

Year	Survey	Station	Date	# Tows Processed	Species	Total Catch	Min Length	Max Length	Avg Length	Region
2022	5	705*	16-May-22	3	Longfin Smelt	3	24	27	25.7	Sac. River System
2022	5	706***	16-May-22	2	Longfin Smelt	220	19	36	28.0	Sac. River System
2022	5	707**	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	711*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	712**	16-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	716	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	718	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	719	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	720	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	723	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	724	19-May-22	3	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	726	19-May-22	2	No Smelt Catch	0	NA	NA	NA	Sac. River System
2022	5	809	17-May-22	3	Longfin Smelt	1	23	23	23.0	Central & South Delta
2022	5	812*	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	815	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	901*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	902**	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	906	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	910	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	912*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	914*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	915*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	918*	16-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta
2022	5	919*	17-May-22	3	No Smelt Catch	0	NA	NA	NA	Central & South Delta

[illegible]

[illegible]

Table 4. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island midwater trawls from a total of 30 tows conducted on May 31, June 1, and 2, 2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018N	05/31/2022	LFS	None	31	1	Released	Chipps Island