Name of study: Delta Smelt Larval Survey (DSLS)

Program element: 096

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Purpose/Objective: Monitor and provide information on larval delta smelt abundance and distribution in the upper San Francisco Estuary.

Conduct larval fish surveys to determine the timing, distribution, and abundance of delta smelt larvae. Help estimate larval delta smelt fish losses and determine the magnitude of entrainment of larval delta smelt at CVP and SWP intakes.

Data collected: temperature, electro-conductivity, water transparency, water volume, tidal stage, fish, and zooplankton.

Geographic range of field work: upper San Francisco Estuary.

Number of sites: between 19 and 49 stations.

Period of record (start year): 2005.

Size for complete database for program element in KB (MB): 5+ megabytes.

Number of individual files: one file or database contains all data.

Sample frequency per time unit (second, week, month): starting in mid-winter (January/ February) sampling is conducted every other week and continues through early summer (June/July) or until catch efficiency decreases and/or delta smelt are not in danger of being entrained at the CVP and SWP.

Field sampling: The DSLS nets include two larval nets deployed near the bow of the boat (fore nets) and two larval nets deployed from the stern of the boat (aft nets). The fore nets are conical plankton nets 3.35 m in length with a mouth opening of 0.196 m^2 and are secured to a bridle attached to aluminum poles. These nets have a 505 μm Nitex monofilament mesh with canvas cod-end sections. The aft nets are made of the same material and mesh as the fore nets but also have a durable canvas mouth as well as cod-end sections are attached to the net to prevent premature wear from contact with the substrate. All nets can be deployed at once. Aft net deployment can vary depending on sharing boat resources with the 20-mm Survey program. Fish are collected in a removable 2.2 L screened (474 μm stainless steel wire bolting cloth) cod-end jar. Zooplankton are collected with a Clarke-Bumpus (CB) net attached to the top of the aft net frame. The CB net consists of 160 μm knotless nylon mesh and measures 78 cm long with a 12 cm mouth diameter. A General Oceananics flowmeter is mounted in the mouth of all fish nets and CB net to estimate the volume (m^3) of water sampled. After each tow, the entire sample is transferred to a labeled holding jar containing 10% formalin neutralized with sodium borate. Rose Bengal dye is added to each jar to aid in separating animals from detritus.

Laboratory analysis: Sample jars are taken to the laboratory at the California Department of Fish and Game's Bay Delta Branch, Stockton. For fish samples, the complete contents are sorted and any larval fish present are identified and counted. All fish are identified to species or lowest possible taxon. The first 50 fish from each tow are randomly selected and measured (FL) to the nearest millimeter. All delta smelt are measured regardless of catch size.

Individual zooplankton samples are diluted in a beaker to a concentration that will give approximately 200 organisms per ml. The sample is thoroughly mixed and a one millimeter aliquot is extracted and placed on a Sedgewick-Rafter slide cell. Six percent of a diluted sample will be processed with a minimum of 5 cells and a maximum of 20 cells. This processing method provides a better estimate of the organisms in a sample and increases the sensitivity of detection for the relatively less abundant organisms. All zooplankton are counted and identified down to family and most are identified to genus. All lab data is recorded on data sheets corresponding to field measurements and entered into a relational database.

Relative density analysis:

The mean number of fish per volume water sampled (standardized to 1,000 m^3) is calculated using the following equations:

$$V_t = A * K * D$$

Where: V = volume of water (m^3) filtered through the net per tow (t)

A = mouth opening of the net (m^2)

K = calibration factor for the flow meter

D = difference in flow meter counts from start to finish of tow

$$n_t = F_t / V_t * 1{,}000\ m^3$$

Where: n = number of fish per 1,000 m^3 per tow (t)

F = fish sampled per tow

V = volume of water filtered through the net (m^3) per tow

$$N = \Sigma n_t / 3$$

Where: N = mean number of fish per 1,000 m^3 per station.

Zooplankton processing:

$$Z = \Sigma(C_c X / V) / N$$

Where:

Z = the number of zooplankton per m^3

C = the number of zooplankton taxon counted per cell (c)

X = the sample volume (sample dilution)

V = the volume of water filtered by the net m^3

N = number of cells completed.

Changes over time:

2006 - Expansion of field stations further westward (20-mm Survey Stations) to increase coverage for delta smelt and longfin smelt. Added zooplankton sampling to the program.

2007 – 'Delta-wide' surveys ceased. Targeted delta smelt sampling using SKT as spatial and temporal indicator for sampling. Two (2) stations in north Delta sampled for 48 hours straight.

2008 – Six (6) stations in the Cache Slough Complex (historic CA DFG NBA stations) are added to the existing CA DFG 20 mm Survey to increase spatial coverage. 20 mm Survey protocol followed.

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