

Name of study: Spring Kodiak Trawl Survey

Program element: 088

Program manager: Bob Fujimura, bfujimura@dfg.ca.gov

Project Lead: Julio Adib-Samii, jadibsamii@dfg.ca.gov

Agency: Department of Fish and Game, Bay Delta Division

Address: 4001 North Wilson Way, Stockton, CA 95205

Phone: (209) 948-7800, Fax: (209) 946-6355

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

Conduct fish surveys to determine the timing, distribution, and abundance of spawning delta smelt and to provide maturity/egg-stage data for adult delta smelt. Help estimate delta smelt fish losses and determine the magnitude of entrainment of both larval and adult delta smelt at CVP and SWP intakes. Improved detection of delta smelt will better inform water-export facility operators of the potential to entrain adult delta smelt in subsequent weeks and their offspring later in the year.

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

Geographic range of field work: upper San Francisco Estuary.

Number of sites: 39 sites from 2002 to 2004. 40 sites from 2005 to present.

Period of record (start year): 2002.

Size for complete data base for program element in KB (MB): 7.0 megabytes.

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

Sample frequency per time unit (week, month): starting in early January, sampling is conducted monthly and continues until late spring, or until detectable spawning of delta smelt has ended. The Delta-wide

distributional survey (4-5 days) takes place at the beginning of the month and the Supplemental survey (if conducted) occurs two weeks after.

Field sampling: The SKT survey employs a standard Kodiak trawl with a total length of 65' (19.8-m), and a fully expanded mouth opening of 25' by 6' (7.62-m by 1.83-m). A weighted foot-rope and head-rope with floats allows the trawl to fish the top 1.8-m of the water column. The trawl is constructed of green or black variable mesh ranging in dimension from 2" knotted stretched mesh at the mouth and decreasing by ½" through a series of 5 panels to ¼" knotless stretched mesh at the cod-end. The cod-end is tied off with a slipknot. A 10-lb. cannon-ball weight is attached to each wing-tip, and a 15-lb cannon-ball weight is attached on each side of the net approximately 10-ft forward of the mouth. Secchi depth, surface water temperature, and surface water EC are taken prior to each tow at each station and are recorded on the field data sheet. The net is deployed and towed for nine minutes and thirty seconds. Flow meter readings are taken upon completion of each tow and the contents of the net are identified, enumerated, measured, and recorded on the field data sheet.

Laboratory analysis: All unidentifiable fish are returned to Laboratory in Stockton for positive identification. Further or secondary gonadal staging of delta smelt may occur at this time.

Relative density analysis:

The mean number of fish per volume water sampled (standardized to 10,000 m³) is calculated using the following equations:

$$V = A * K * D$$

Where: V = volume of water (m³) filtered through the net per tow (one tow per station)

A = mouth opening of the net (m²)

K = calibration factor for the flow meter

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

$$N = F / V * 10,000 \text{ m}^3$$

Where: N = number of fish per 10,000 m³ per station

F = fish sampled per station

V = volume of water filtered through the net (m³) per station

Changes over time: Please consult the SKT S.O.P. and Protocol for complete sampling procedures.

2002 – Survey's inception. Sampling protocol is developed.

2003 – All delta smelt are measured and enumerated in the field for the purpose of obtaining fresh fork lengths, not formalin preserved fork lengths. Maturity/egg stages for all delta smelt are determined in the field. Sub-samples (15-25 delta smelt per station) are retained for researchers at UC Davis. Each retained delta smelt is identified in the database by a unique numeric identifier. Egg samples from each female delta smelt are retained and preserved in 6:3:1 clearing solution with the unique numeric identifier associated with the sub-sampled fish. Heads from all delta smelt are severed and preserved in 70% ethanol with the unique numeric identifier associated with the sub-sampled fish. The remaining body of the sub-sampled fish is preserved in 10% buffered formalin with the unique numeric identifier.

2004 – Due to limited funding during 2004, it was decided to retain only samples from stage 4 females, collecting no more than 30 stage 4 individuals per station.

2005 – Station 719 (Sacramento Deep Water Channel) is added to the core list of sampling sites and incorporated into the delta wide survey. For delta smelt sub-sample processing; up to 20 fish per station during the Delta-wide surveys and up to 30 fish per station from the Supplemental surveys are retained for UC Davis researchers. Head, body, egg and caudal fin samples are collected. Only egg samples from stage 3 and 4 females are retained. Cod end mesh of the Kodiak net is changed from ¼' stretched mesh to 1/8' stretched mesh.

2006 – No egg or caudal fin samples are collected or retained. Cod end mesh of the Kodiak net is changed from 1/8' stretched mesh back to ¼' stretched mesh in an effort to reduce take of current year class of fish.

2007 – N/A

2008 – IEP Management Team eliminates Supplemental Surveys to reduce take. Sampling only includes the delta wide survey once a month.

2009 – To avoid excess take associated with large delta smelt catches, staff biologists implement additional protocol when sampling stations with historically high delta smelt density. This protocol has identified specific stations where two 5 minute tows are conducted instead of one 10 minute tow. If < 50 delta smelt are collected in the first 5 minute tow, conduct a second 5 minute tow. If ≥ 50 delta smelt are collected in the first 5 minute tow, no additional 5 minute tow is necessary.

2010 – Implementation of the use of a Hach Model # 2100P Turbidimeter as Standard Operating Procedure to record turbidity in NTU's.

Revised: August 2010