Interagency Ecological Program for the San Francisco Estuary

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2012 20 mm Survey

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The California Department of Fish and Wildlife (CDFW) staff conducts the 20 mm Survey annually to monitor the distribution and relative abundance of larval and juvenile Delta Smelt (*Hypomesus transpacificus*) in the upper San Francisco Bay Estuary. The survey began in 1995 and supplies real-time catch data to water and wildlife managers as part of an adaptive management strategy to limit the risk of entrainment to Delta Smelt from water exports.

From March to July of 2012, staff completed nine bi-weekly surveys. A total of 47 stations (Figure 1) were sampled each survey to measure larval fish and zooplankton densities. Larval fish were collected using a conical net with 1600-micron mesh. The 20 mm net is 5.1 meters long with a mouth area of 1.51 square meters, and is attached to a rigid steel D-ring frame that is mounted on skis. At each station, the entire water column was sampled using three stepped-oblique tows. A zooplankton tow was also simultaneously collected. All samples were preserved in 10% buffered and dyed formalin for later identification in the laboratory.

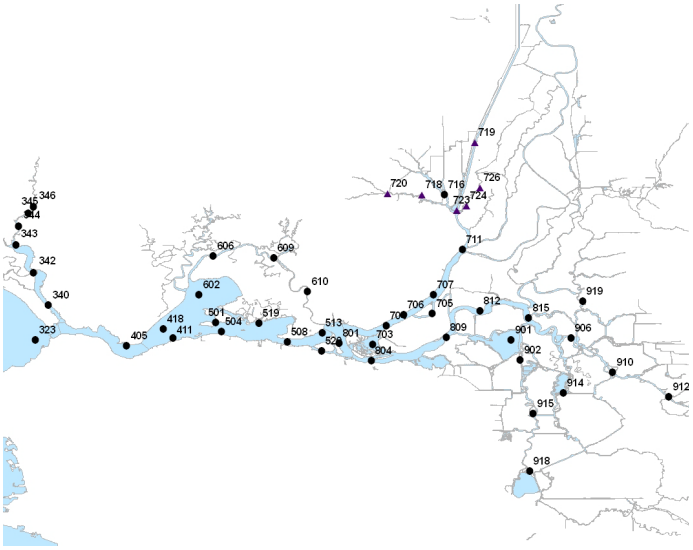

Figure 1 The CDFW 20 mm Survey station map, showing current sampling station locations in the upper Sacramento-San Joaquin Estuary. Stations marked with a black dot are core stations, stations marked with a purple triangle are non-core stations.

A total of 52,420 fish (42 taxa) were collected in 2012. Delta Smelt was the sixth most abundant species, making up about 2% of the total catch (Table 1). Larval and juvenile Delta Smelt catches were relatively low during March and April, increased in early May, and peaked in late May (Survey 6; n=441) providing the highest catch per survey since 2001. Delta Smelt catch decreased but remained relatively high in early June, and then dropped off for the final two surveys in June and July. This decrease has been apparent during prior 20 mm Survey seasons, as the larger juveniles are no longer efficiently retained in the net (Figure 2).

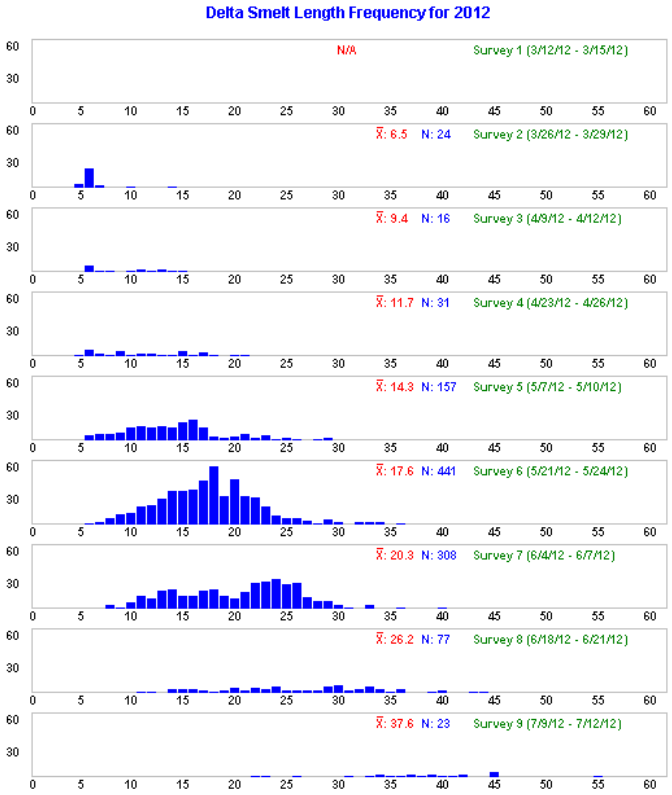

Figure 2 Delta Smelt length frequency distributions from the CDFW 2012 20 mm Survey (http://dfg.ca.gov/delta/data/20mm/Length_frequency.asp)

The first Delta Smelt larvae were caught at the end of March (Survey 2) and ranged in size from 5 to 14 millimeters, indicating that spawning had begun by early March. The last newly-hatched larvae were caught in May, indicating an end to the spawning season (Figure 2). Larval Delta Smelt were found throughout the estuary, including the confluence, Montezuma Slough, and the Napa River (Figure 3). It is likely that adult Delta Smelt used these same locations within the estuary to spawn, as mature adults were caught during the same time period in the CDFW's Delta Smelt spawner survey (Spring Kodiak Trawl).

Table 1 Total species caught from the 2012 CDFW 20 mm Survey

Common Name	*n*	*% Catch*
Tridentiger spp.	19,253	36.73%
Pacific Herring	12,869	24.55%
Striped Bass	9,811	18.72%
Longfin Smelt	3,543	6.76%
Northern Anchovy	1,291	2.46%
Delta Smelt (YOY)	1,077	2.05%
Delta Smelt (adults)	62	0.12%
Yellowfin Goby	1,112	2.12%
Bay Goby	956	1.82%
Prickly Sculpin	846	1.61%
American shad	438	0.84%
Threadfin Shad	360	0.69%
Arrow Goby	252	0.48%
White Catfish	112	0.21%
Three Spine Stickleback	94	0.18%
Jacksmelt	42	0.08%
Cyprinids (unid)	33	0.06%
Shimofuri Goby	31	0.06%
Pacific Staghorn Sculpin	30	0.06%
Centrarchids (unid)	28	0.05%
Chinook Salmon	24	0.05%
Wakasagi	22	0.04%
Inland Silverside	21	0.04%
Longjaw Mudsucker	21	0.04%
Bigscale Logperch	17	0.03%
Splittail	15	0.03%
Carp	11	0.02%
Sacramento Sucker	11	0.02%
Starry Flounder	6	0.01%
Shokihaze Goby	6	0.01%
English Sole	5	0.01%
Black Crappie	3	0.01%
Topsmelt	3	0.01%
Channel Catfish	3	0.01%
Rainwater Killifish	2	<0.01%
Bay Pipefish	2	<0.01%
Tule Perch	2	<0.01%
Mosquitofish	1	<0.01%
Goldfish	1	<0.01%
Sacramento Blackfish	1	<0.01%
Lampreys (unid)	1	<0.01%
White Croaker	1	<0.01%
Cheekspot Goby	1	<0.01%

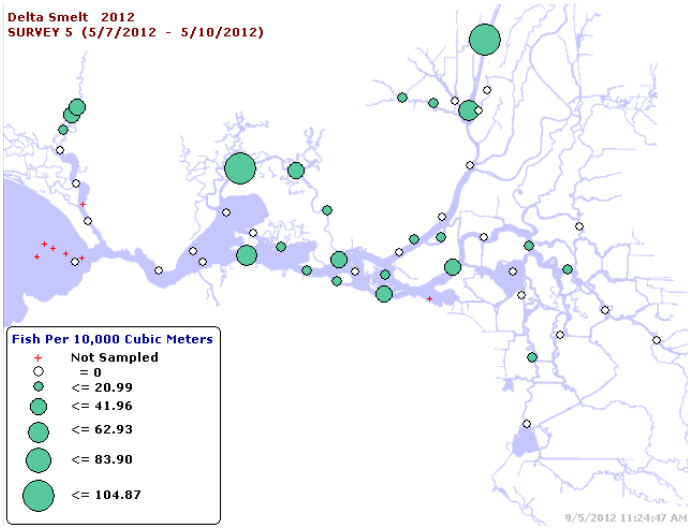

Figure 3 Delta Smelt distribution map from CDFW 20 mm Survey 5 (taken from http://dfg.ca.gov/delta/projects.asp?ProjectID=20mm). Green bubbles represent the relative CPUE of YOY Delta Smelt at each site (see legend). White bubbles are sampled stations with no YOY Delta Smelt caught. Red crosses indicate the station was not sampled (these stations are not part of our current surveys).

An index of abundance for larval/juvenile Delta Smelt is calculated using data from the four surveys around which the mean size of young of the year (YOY) Delta Smelt is 20 mm. The index is calculated using only the 41 core stations, which have been sampled consistently since the survey's inception. The 2012 index was 11.1 and was calculated using Surveys 5 (May) through 8 (June). This year's index is the eighth highest on record, and the highest index since 2005 (Figure 4). The increase in the relative abundance of larval and juvenile Delta Smelt in 2012 was likely due to the wet 2010/2011 water year, which provided relatively good conditions for adult Delta Smelt recruitment, development, and spawning.

Fish distribution maps, length distributions, and catch per unit effort (CPUE) by station for the current and previous years are reported on the 20 mm Survey webpage (http://dfg.ca.gov/delta/projects.asp?ProjectID=20mm). Existing data and metadata can be found at our FTP site (ftp://ftp.dfg.ca.gov/Delta%20Smelt/) and detailed methods on the calculation of the 20 mm abundance index are available through this author.

Year	Index
1995	4.4
1996	33.9
1997	19.3
1998	7.7
1999	39.7
2000	23.8
2001	11.3
2002	8.0
2003	13.1
2004	8.2
2005	15.4
2006	9.9
2007	1.0
2008	2.9
2009	2.3
2010	3.8
2011	8.0
2012	11.1

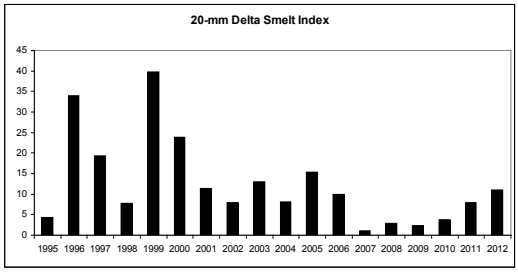

Figure 4 The annual index of abundance for YOY Delta Smelt for the historical record of the CDFW 20 mm Survey

Specific-Conductance and Water Temperature Data, San Francisco Bay, California, for Water Years 2008-10

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Introduction

The U.S. Geological Survey (USGS) has continuously monitored specific conductance (a surrogate that can be converted to salinity) and temperature in San Francisco Bay since 1989 and these data are a valuable resource for the San Francisco Estuary community. This monitoring is part of the Interagency Ecological Program to comply with Order 10 of Water Rights Decision 1485. Delta outflow is a key driver affecting Bay habitat (salinity) and circulation, including flushing of South San Francisco Bay (McCulloch et al. 1970, Shellenbarger et al. 2013). These data provide the basis for calibrating and validating many numerical models of San Francisco Bay used to design development projects and restore wetlands, including the Napa/Sonoma Marsh Restoration, Hamilton Airfield Restoration, dredged material disposal studies, San Francisco Airport Runway Expansion, Bair Island Restoration, South Bay Salt Pond Initial Stewardship Plan, and the South Bay Salt Pond Restoration Project. The data have been analyzed to determine the effect of flow diversions on Bay salinity (Shellenbarger and Schoellhamer 2011) and used as ancillary data by many other studies. The salinity stations are part of a larger continuous monitoring program that includes suspended-sediment concentration monitoring supported by the U.S. Army Corp of Engineers as part of the Regional Monitoring Program for Water Quality in the San Francisco Estuary and other agencies (Schoellhamer et al. 2007).

This article presents time-series graphs of specific-conductance and water-temperature data collected in San Francisco Bay during water years 2008-10 (October 1, 2008, through September 30, 2010). Specific-conductance and water-temperature data were recorded at 15-minute intervals at five USGS locations (Figure 1, Table 1).

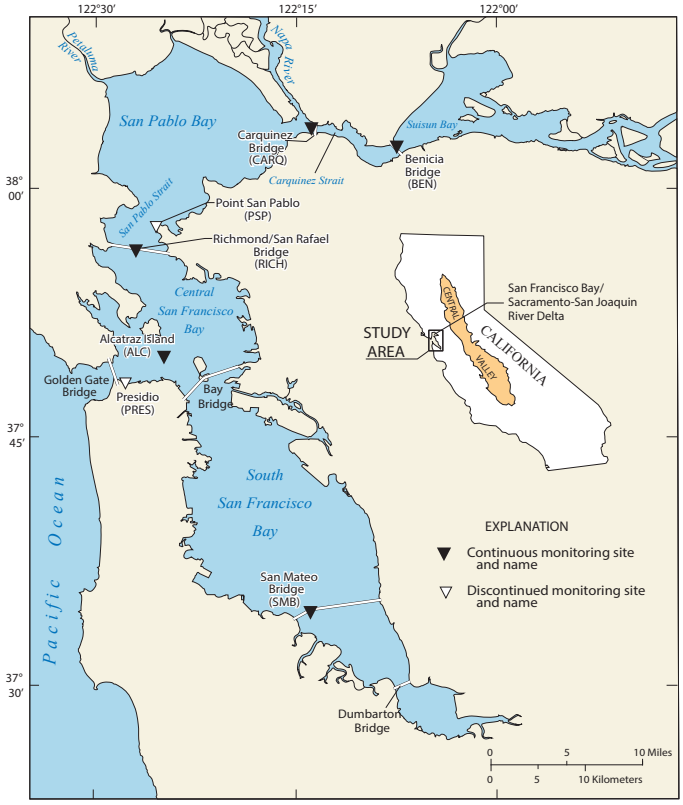

Figure 1 Location of continuous monitoring sites in San Francisco Bay, California

Specific-conductance and water-temperature data from monitoring station San Francisco Bay at San Mateo Bridge (SMB) were recorded by the California Department of Water Resources (DWR) before 1988, by the USGS National Research Program from 1988 to 1989, and by the USGS-DWR cooperative program since 1990. Monitoring stations Suisun Bay at Benicia Bridge (BEN) and Carquinez Strait at Carquinez Bridge (CARQ) were established in 1998 by the USGS. The monitoring station at San Francisco Bay at Alcatraz Island (ALC) was established in 2003 by the USGS to replace the discontinued monitoring station San Francisco Bay at Presidio Military