

Hanson 1994b.

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HANSON ENVIRONMENTAL, INC.

354

MEMO TO: Leo Winternitz  
 Department of Water Resources  
 Copy to: George Baumli  
 State Water Contractors

FROM: Chuck Hanson

DATE: June 17, 1994

SUBJECT: Result of the June 16, 1994 Delta smelt channel vs shoal fishery investigation.

There has been considerable interest and speculation regarding the utilization of shallow water habitat within the Sacramento-San Joaquin Delta and Suisun Bay by juvenile Delta smelt. The basis for this interest has been, in part, reports of fisheries surveys in which larger numbers of juvenile and adult Delta smelt have been collected in shallow water areas than in deeper water channels. These observations have led to concern regarding potential adverse effects of dredging activity in the removal of shallow water areas, and the development of shallow water habitat as one approach to mitigating for losses of Delta smelt as the result of entrainment into water diversions and other sources of mortality.

On June 16, 1994 we performed a series of fisheries collections to test the null hypothesis that juvenile Delta smelt densities are not significantly different between deep water channel areas and shallow water areas. The sampling design for these fisheries collections utilized a Kodiak trawl to sample shallow water areas (less than 10 feet deep) and deep water areas (greater than 10 to 45 feet deep). Four collections were made within both the shallow and deep water areas within the lower San Joaquin River adjacent to Twitchell Island (marker 33A and 35), within the lower Sacramento River adjacent to Decker Island (CDFandG summer tow net survey station 707), and within Suisun Bay adjacent to Chippis Island (CDFandG summer tow net survey station 508). Each Kodiak trawl was scheduled to be 10 minutes in duration, however tow durations were reduced to five minutes in those areas where large numbers (greater than 50) of Delta smelt were anticipated to be collected in each individual trawl. A General Oceanics flow meter was used to estimate the water volume sampled during each trawl for use in calculating the number of Delta smelt captured per 1,000 m<sup>3</sup> of water sampled. The Kodiak trawl typically samples approximately 6,500-7,000 m<sup>3</sup> in a 10-minute sample. All sampling was performed on June 16, 1994 between 0840 and 1648 hours. The collection of the eight Kodiak trawls within each of the three designated sampling areas required a period of approximately two hours. Sample collection was performed by collecting two samples in the shallow area, followed by two samples in the deep area, and then the cycle was repeated to minimize the potential effects associated with tidal variation that may occur during the period when sampling was being performed.

Is it the upper portion  
 of the water column  
 deeper water?

Is it that deep & shallow  
 water are not equally available?

Results of the fishery collections are summarized below:

Delta smelt density (No/1,000 m <sup>3</sup> )						
..	San Joaquin Twitchell (35)		Sacramento Decker (707)		Suisun Bay 508	
	Shallow	Deep	Shallow	Deep	Shallow	Deep
	0.59	0.73	14.3	1.23	4.20	7.84
	0.46	3.32	2.9	0.32	7.12	1.28
	0.91	0.86	24.69	0.67	2.36	5.65
	0.43	2.04	2.17	0.56	1.59	1.78
Mean	0.60	1.74	11.02	0.70	3.82	4.14
SD	0.22	1.21	10.68	0.39	2.46	3.15

The majority of Delta smelt collected as part of these surveys were young-of-the-year typically ranging in length from 32-42 mm.

Mann-Whitney U rank sum two sample tests were used to test whether Delta smelt densities were significantly different between deep and shallow water habitats at each of the sampling stations. Delta smelt densities were not significantly different between shallow and deep water areas within the San Joaquin River (Twitchell Island) ( $p = 0.11$ ) or within Suisun Bay (Station 508) ( $p = 0.88$ ). However, Delta smelt densities were significantly different between shallow and deep water habitats in the lower Sacramento River adjacent to Decker Island (Station 707) ( $p = 0.03$ ). Water depths at the start of the Kodiak trawls within the Sacramento River ranged from 6-10 feet within the designated shallow sampling stations, and from 33-34 feet at those sampling areas characterized as deep water.

Results of this limited series of fisheries collections, although not conclusive, suggest that additional fisheries sampling within shallow and deep water areas throughout the Delta would be required to characterize habitat utilization by various lifestages of Delta smelt. The importance of shallow water areas and shoals as primary juvenile Delta smelt rearing habitat requires further investigation particularly if these areas are to be developed as mitigation habitat for compensation of unavoidable losses associated with operations of various projects. It should be cautioned, however, that results of this reconnaissance-level survey are not conclusive and do not reflect the range of either potential habitat areas or various environmental conditions that may be important in influencing the quality and availability of various habitat types for both juvenile and adult Delta smelt. Furthermore, results of these reconnaissance surveys do not reflect the potential importance of shallow water areas within the Delta and Suisun Bay as areas

of potentially increased productivity, refuges from predators, or foraging areas. Also, results of this study do not reflect changes in potential Delta smelt habitat utilization between day and nighttime conditions. Survey techniques using the Kodiak trawl are limited to collections within only the upper six feet of the water column and hence, do not reflect Delta smelt abundance throughout the water column at the deeper water sampling stations. The Kodiak trawl is also limited to sampling areas with water depths greater than approximately seven feet and hence, do not reflect Delta smelt utilization of very shallow inshore or shoal areas. These and other factors should be given further consideration as we begin the process of gaining greater understanding of the life history and habitat preferences for various lifestages of Delta smelt.