The presence and relative abundance of delta smelt *(Hypomesus transpacificus)* in the Sacramento Deep Water Shipping Channel.

Julio Adib-Samii, California Department of Fish and Game

Introduction

The California Department of Fish and Game (CDFG) conducted several 'supplemental' surveys in 2009 within the Sacramento Deep Water Shipping Channel (SDWC) to gain presence and relative abundance information regarding delta smelt. Adult Delta smelt winter-spring presence in the lower SDWC has been well documented by the CDFG's Spring Kodiak Trawl Survey from January through May, but usage of the SDWC as rearing habitat by young-of-the-year delta smelt is relatively unknown (see Sommer et al. 2009). The SDWC runs roughly 23 nautical miles (~26.5 statute miles) from its mouth at Cache Slough to the turning basin in West Sacramento. The purpose of these sampling efforts was to better understand the seasonal SDWC usage by delta smelt, and further assist the efforts for recovery of the species. Here I present results from the first 3 supplemental surveys of 7 planned for the year.

Methods

Supplemental surveys were conducted in the summer of 2009. These surveys employed two CDFG Long Term Monitoring (LTM) Survey gear types to target early life stage delta smelt. Sampling gear from the 20mm Survey was used on June 15, and gear from the Townet Survey (TNS) was used on July 13 and August 10.

Each survey consisted of sampling 6 stations spread along the length of the SDWC, and arranged between 4 and 6 nautical miles apart. Two, 10 minute stepped oblique tows were conducted at each station (protocol available through this author). All fish collected were identified to species and enumerated. Data collected at each station included catch (all tows summed), fish length (fork length in mm), water temperature (°C), Secchi depth (cm), and specific conductance (SC: µS/cm @ 25°C).

Results

Each environmental quality parameter measured showed a similar geographic trend across all three surveys. For specific conductance, low conductivity (<500 µS/cm) was observed at the mouth of the SDWC and steadily increased up the channel to ~1400 µS/cm in the turning basin (Figure 1A-1C). Conductivity remained relatively constant at each location throughout the three surveys. Secchi depths increased slightly with each successive survey, but generally followed the same pattern: relatively low (<= 55cm) at the mouth, somewhat lower mid-way up the SDWC and increasing thereafter to relatively high depths (as high as 167cm) towards the turning basin (Figure 1A-1C). Surface water temperature geographic trend was similar during all three surveys as well; relatively low (20.4 – 22.0°C) at the mouth and gradually increasing to relatively high (22.3 – 24.8°C) in the turning basin (Figure 1D). Similarly, surface temperatures increased at each location with each successive survey.

June delta smelt catch was highest with 94 individuals collected from 5 out of 6 stations, whereas July and August catches dropped to 4 and 1 respectively (Table 1). A similar drop in catch was observed with each successive survey in all but 2 of the other species encountered: inland silversides showed an increase in catch from June to July and wakasagi showed an increase in catch from July to August (Table 1).

Discussion

The declining catches of all species observed after the June survey likely resulted from a combination of changing environmental conditions, particularly increased water temperatures, and changing gear selectivity, specifically the increased mesh size of the TNS gear, which didn't retain smaller, more abundant life stages of some species, compared to 20mm gear. For delta smelt, fork length data indicated that the drop in overall catch from June to July and August was not due to retention in the net; delta smelt collected were well within the size range retained by the Townet Survey gear. Rather, unfavorable changes in environmental conditions (i.e. increased Secchi depths and increased temperatures) may have led to emigration or increased mortality, likely causes for lower catches.

Results from these surveys are congruous with findings of Feyrer et al. (2007) and Nobriga et al. (2008), in that abiotic habitat parameters are limiting factors in presence and ultimately the abundance of delta smelt. While the extent of SDWC usage by delta smelt is still unclear, these surveys have shown that delta smelt are limited in their ability to utilize the SDWC year round. SDWC sampling will continue monthly through December using the CDFG Fall Midwater Trawl gear, and results will likely shed more light on SDWC usage.

References

Feyrer, F., M. L. Nobriga, and T. R. Sommer. 2007. Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA. Canadian Journal Fisheries & Aquatic Sciences 64:723-734.

Nobriga, M. L., T. R. Sommer, F. Feyrer, and K. Fleming. 2008. Long-term trends in summertime habitat suitability for delta smelt (*Hypomesus transpacificus*). San Francisco Estuary and Watershed Science 6(1).

Sommer, T., K. Reece, F. Mejia, and M. Nobriga. 2009. Delta smelt life-history contingents: a possible upstream rearing strategy. IEP Newsletter 22(1):11-13.

Acknowledgments

Big thanks to Bob Fujimura and Randy Baxter for providing me the opportunity and time for this project. Thanks to my field and lab support for all the help.

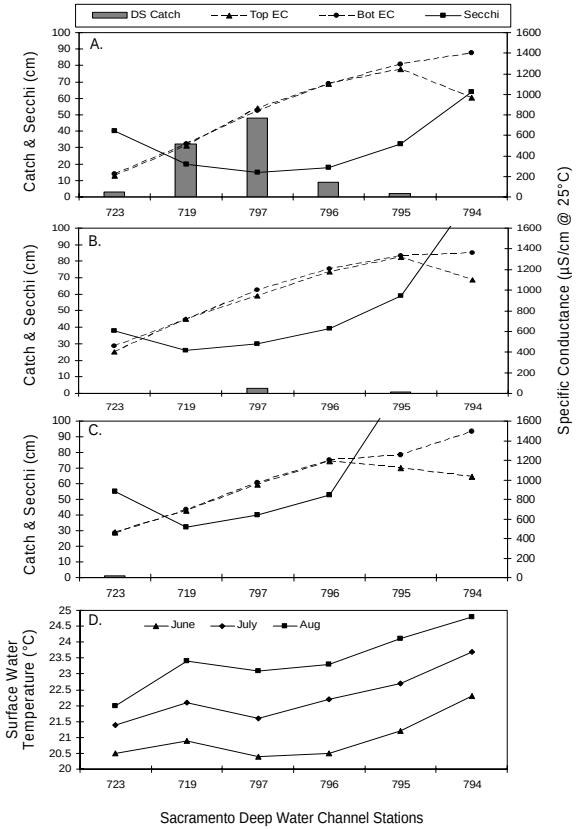

Figure 1. June (A.), July (B.), and August (C.) delta smelt catches from the CDFG's 2009 Supplemental SDWC Sampling compared to recorded environmental conditions. Figure 1D plots surface water temperature recorded during sampling for all three surveys; June, July, and August..

Table 1. June, July and August species composition and catch results from the CDFG's 2009 Supplemental SDWC Sampling. Catch results are comprised of all tows summed for a station. Note: Yellowfin goby catch is not included in this table (only 4 total collected during the June survey).

	Station	American Shad	Channel Catfish	Delta Smelt	Inland Silverside	Striped Bass	Threadfin Shad	Tridentiger spp.	Wakasagi	White Catfish
June	723	4		3		69	1	11		35
	719	17	4	32		14		158	1	27
	797	18	5	48	6	14		336	2	2
	796	38	1	9	5	47	14	898	1	1
	795	19		2		64	499	698	2	6
	794				4	11	414	1003		3

	Station	American Shad	Channel Catfish	Delta Smelt	Inland Silverside	Striped Bass	Threadfin Shad	Tridentiger spp.	Wakasagi	White Catfish
July	723		2			1		2		10
	719	16	1			1	1	3		7
	797	5	1	3	6	2	3	18		
	796	6			17	1			1	
	795	4		1	23	1	30	34		
	794									

	Station	American Shad	Channel Catfish	Delta Smelt	Inland Silverside	Striped Bass	Threadfin Shad	Tridentiger spp.	Wakasagi	White Catfish
August	723			1				2		2
	719	3			5		2	7	1	
	797	9			1		8	12	1	
	796	1						9	1	
	795						1	2		
	794