Lake Washington Sockeye Smolt Collection: 2010 Annual Report

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Introduction

The Cedar River is a major contributor to the Lake Washington sockeye population. Sockeye are originally a Baker River stock that were introduced into the Lake Washington basin between 1917 and 1945 and naturalized in the system by the 1960's (Kolb 1971). Today, sockeye production from the Cedar River includes both natural and hatchery-origin portions. Hatchery-origin sockeye are reared at Washington Department of Fish and Wildlife's (WDFW) Landsburg Hatchery. Broodstock for this program is of Cedar River origin. The purpose of this hatchery program is to mitigate for loss of sockeye salmon spawning habitat above Landsburg Dam which was built in 1901, blocking anadromous fish migrations, in order to provide a majority of Seattle's water supply. A fish passage facility began operating in 2003 and allows coho and Chinook salmon access to spawning and rearing habitat above Landsburg Dam.

The Cedar River sockeye population has been well monitored during both riverine portions of their life cycle, as adult spawners and emergent fry. Adults return to the river to spawn in September. Numbers of adult spawners have been monitored by local, state, and tribal entities since 1967. Between January and May of each year, natural-origin sockeye emerge from the gravel and migrate downstream to Lake Washington. Production and survival of sockeye fry has been monitored by the Washington Department of Fish and Wildlife (WDFW) since the 1992 outmigration (1991 brood year). Production is estimated by expanding catch in an inclined-plane trap positioned near the river mouth (Seiler and Kishomoto 1996; Kiyohara and Zimmerman 2010)

Beginning in 1992, hatchery sockeye fry have been released into the Cedar River. Since 1992, hatchery-origin sockeye have been released as both fed and un-fed fry over the natural outmigration period. Hatchery releases are classified into three release categories: (early, middle, and late) and have occurred at different locations in the watershed. The purpose of these multiple strategies has been to evaluate which strategy maximizes survival and minimizes impacts to natural-origin sockeye. Survival of natural and hatchery-origin sockeye is studied at two subsequent points of their life history – smolts leaving the lake and adult spawners returning to the basin. Once released, hatchery-origin sockeye are assumed to experience similar conditions to natural-origin sockeye during their predominantly one year rearing period in Lake Washington and during the migration to the sea through the Hiram Chittenden Locks.

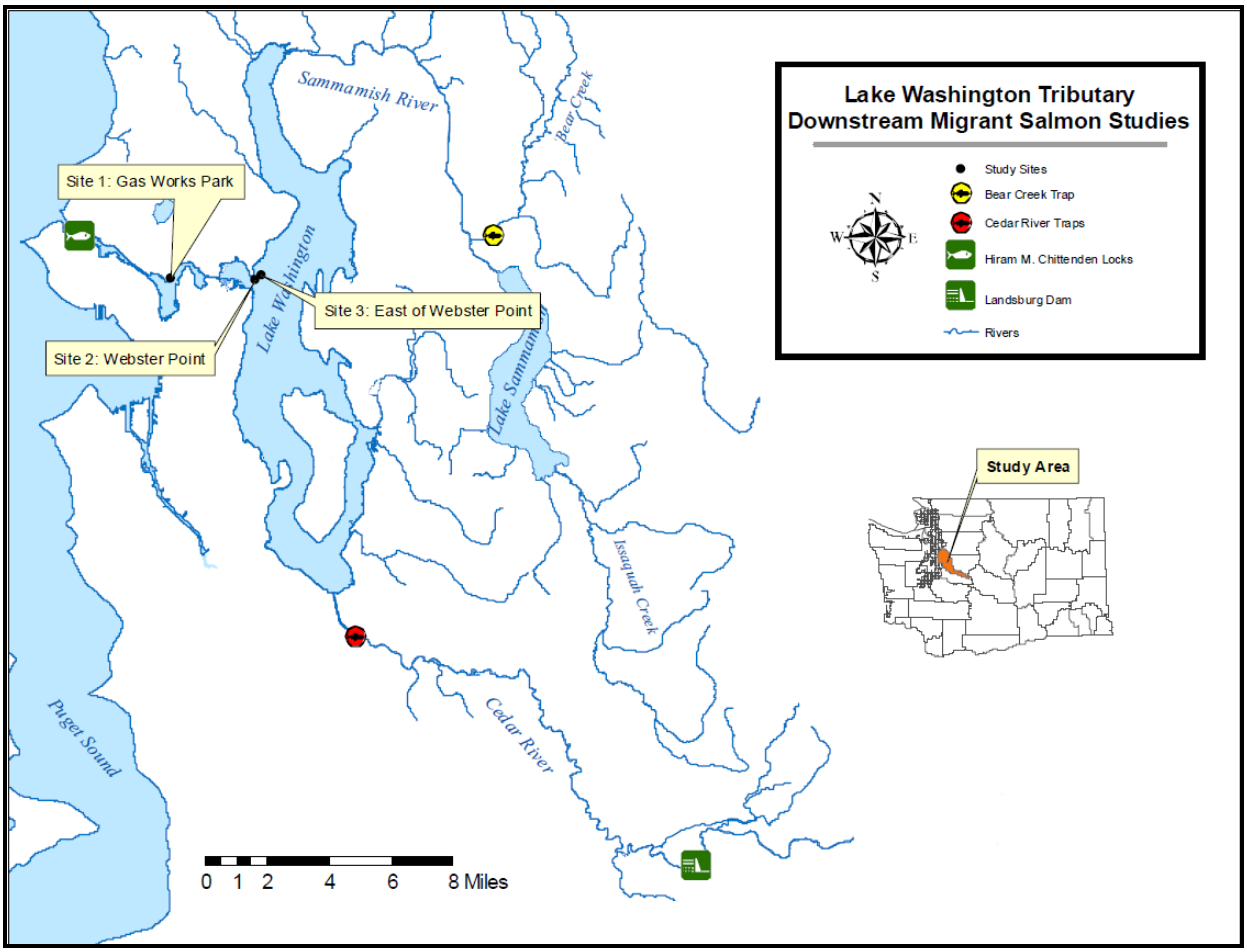

Figure 1. Locations of sockeye sampling sites in the Lake Washington basin.

This report details the collections of sockeye smolts as they begin their migration to the sea. Sockeye smolts are collected in order to compare survival among release strategies and between natural and hatchery-origin sockeye. Natural and hatchery-origin sockeye in Lake Washington have no external marks to distinguish them by origin. The small body size of released hatchery sockeye prohibits marking tools such as adipose clips and coded-wire tags that are used as external marks on other hatchery releases in Washington State. In Lake Washington, hatchery sockeye fry receive a thermally-induced otolith mark (Volk et al 1990). This mark is detectable if the fish is lethally sampled and the otolith removed and processed. Thermal marking is applied in different patterns in order to specify release timing, location, and condition.

In 2004, WDFW began collection of sockeye smolts from Lake Union and Lake Washington during the sockeye outmigration period in the month of May. Otoliths were harvested from collected sockeye with the goal of better understanding relative survival of natural-and hatchery-origin sockeye, as well as relative survival rates of the different hatchery release strategies (Schroder et al 2009)). This report summarizes the 2010 collections in Lake Union and Lake Washington. Results of the otolith analysis will be presented in a separate report prepared by WDFW's otolith lab.

Methods

Gear

A seine net was deployed from a 10-m pontoon barge powered by an outboard motor. The net had 2 cm mesh and was 206 m in length and 11 m in depth. The net was assembled on the barge and deployed by an outboard powered skiff. The skiff pulled the net off the barge in a manner similar to that of commercial purse seine operations. The net was deployed, towed for a length of time, and rounded back to the barge. The bottom of the net was closed up or "pursed" and catches were examined.

Collection

Collection of sockeye smolts occurred once a week during May 2010 (May 6, 11, 18, and 25). Three collection sites were Lake Union near the east buoy at Gas Works Park (N 47°38.667' and W 122°19.776'), the channel marker off Webster Point (N 47°38.836' and W 122°16.654'), and the east side of Webster Point (N 47°38.928' and W 122°16.349'). Between two and five sets were made each day. Set fishing times ranged from 25 to 50 minutes. If initial visual observations of the catch indicated a large catch of Chinook, the end of the net was let go and all fish were released. This approach was adopted in order to minimize stress on juvenile Chinook which are listed as threatened under the Endangered Species Act.

At the end of each set, fish were removed from the seine net with a large dip net. Fish were placed in a large tote for processing. Captured sockeye were saved for analysis. All other fish were returned to the lake. Sockeye kept for analysis were euthanized using MS-222, held in a cooler, and transported to the WDFW otolith lab in Olympia.

Results and Discussion

Twelve sets were completed over the four survey days in May 2010 (Table 1). On the first day of collection, two sets were made at the Gas Works location and no salmonids were captured. During the subsequent three fishing days, the first set was made at Gas Works. This site was selected because most of the fish have been collected at the Gas Works Park location in past years of this study. However in 2010, few fish were captured at this site. Remaining sets were made at the Webster Point locations.

The reason for the lack of sockeye (or other fishes) at the Gas Works location in 2010 was unclear. The water was unusually clear which may have contributed to avoidance behavior by the smolts. However during the towing process, fish were not even observed moving out of the net to avoiding capture.

A total of 1,001 sockeye smolts were collected in May 2010 (Table 1). The size of sockeye smolts in 2010 were considerably larger than previous years based on visual observations and past recollections. Actual length and weight measurements will be quantified and reported by WDFW's otolith lab.

In addition to sockeye smolts, a number of other salmonids were captured. Eight natural-origin Chinook, 496 hatchery origin-Chinook, 281 natural-origin coho, 157 hatchery-origin coho, 4 chum, and 2

pinks were also caught. Both juvenile and adult cutthroat were also caught; 44 juvenile and 1 adult. Three-spined sticklebacks (*Gasterosteus aculeatus*, n = 157*)* were the only non-salmonid species caught.

Table 1. Dates, locations and catches of purse seine sockeye smolt collections, 2010.

Date	Location	Set	Start	End	Total Time	Sockeye	Wild Chinook	Hat. Chinook	Wild Coho	Hat. Coho	Chum	Pink	Juv. Cutt.	Adult Cutt.	3 Spined
6-May	1	1	10:45	11:35	0:50						1				2
6-May	1	2	11:45	12:30	0:45										3
11-May	1	1	10:00	10:45	0:45						3				7
11-May	2	2	11:15	11:50	0:35	325			50						
18-May	1	1	9:15	10:00	0:45	22		7	7						28
18-May	2	2	10:35	11:25	0:50	126	5		26				6		
18-May	2	3	11:30	12:15	0:45								4		2
18-May	3	4	12:30	13:10	0:40	128			8					1	
18-May	1	5	14:50	15:20	0:30							2			75
25-May	1	1	9:10	9:35	0:25										40
25-May	2	2	10:15	11:00	0:45	349	3	486	175	149			34		
25-May	2	3	11:15	12:00	0:45	51		3	15	8					
Total		**12**				**1001**	**8**	**496**	**281**	**157**	**4**	**2**	**44**	**1**	**157**

Citations

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