HREM
Hidden River Environmental Management

•Planning •Permitting •Monitoring •Assessment •Restoration

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Fisheries and Oceans Canada
Resource Restoration Unit
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LAKELSE SOCKEYE ADULT MONITORING

Fry Outplant Program - Sockeye Return 2015

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Executive Summary

In July 2015 Hidden River Environmental Mgmt. was contracted to establish the ratio of enhanced vs wild Sockeye adults returning to Williams Creek. In conjunction with this, marking all fish (with a hole punch) seined at the mouth of the creek, followed up with gillnetting farther upstream at the peak spawning period would also give a population estimate for the 2015 Williams Creek Sockeye escapements. Seining results indicated that enhanced fish (no adipose fin) made up approximately 7.2% of the total 2015 Sockeye escapement to Williams Creek. Gillnetting upstream provided recapture data that gave us a population estimate of 11,598 Sockeye adults.

Introduction

Lakelse Sockeye runs have been a concern for Fisheries and Oceans Canada (DFO) for the past decade. In 2005 the "Lakelse Sockeye Recovery Program" was initiated and during subsequent years the Pacific Salmon Commission provided funding for various Lakelse Sockeye rehabilitation, restoration, and enhancement projects including the Lakelse Sockeye Fry Outplant project.

The Fry Outplant project ran from 2006 to 2014, with the exception of 2009 during which no funding was available. Broodstock was collected in Williams Creek with incubation and rearing taking place at Snootli River Hatchery in Bella Coola. All fry were adipose clipped at approximately one gram prior to release back into Williams Creek. 2014 marked the final year of release of Sockeye fry to Williams Creek. To monitor the success of the program and the overall health of the natural population, a sample of the 2015 Sockeye return was obtained through seining and gill netting on Williams Creek. The ratio of hatchery versus wild returns will be used to give insight on the success of the 2010 to 2012 brood releases, returning as three, four and five year old age classes. The number of mark/recaptures will also be used to generate a population estimate.

Methods

We used the Lincoln-Peterson mark-recapture method to estimate the population of Sockeye returning to Williams Creek. The mark-recapture method requires visiting a population twice. The first visit requires sampling the population, and marking the individuals that are caught. The second visit is to sample the population again and see how many individuals we were able to recapture, indicated by the marking. We repeated the visits throughout August and early September. We used a hole-punch to mark the gill plate of each Sockeye to enable recognition of recaptures (Figure 1). Additional hole-punches were applied in subsequent samples to enable recognition of double, triple and quadruple recaptures.

Figure 1: Hole-punched gill plate

Seining was used for the first part of the mark-recapture method. Seining was carried out from 09:00 AM - 12:00 PM on August 3rd, 7th, 10th, 14th, 17th, 24th and September 2nd, 2015. Seining was conducted approximately 300m upstream of the mouth of Williams Creek (Figure 2). At approximately 150m from the mouth, a stop net was set across the width of the creek to prevent fish from eluding the seine by swimming downstream (Figure 3). The stop net also prevented the local population of spawning adults from swimming upstream into the seine area. After the stop net was secured, a 50 meter seine with a three inch mesh size was set by boat. Starting on the west side of the creek the seine net was fed across the creek below the old fence sill where a deep pool existed and the majority of Sockeye were holding. From the east side of the creek the seine was pulled downstream and then pursed off against a sandy beach on the west bank of the creek (Figure 3). Once secured, the Sockeye were assessed and documented based on origin (wild/enhanced-no adipose) (Figure 7), sex (male/female), and maturity (adult/jack). Before releasing, sockeye received a hole-punch to the right gill plate to indicate they had been seined (Figure 6). In addition to seining, eight gill net sets were completed near the Williams Creek Bridge (HWY 37 crossing) approximately 1200m from the mouth of the creek (Figure 2). Gill netting was completed on August 19th and 26th 2015 from 09:00AM - 12:00PM, and September 4th and 11th 2015 from 09:00AM - 12:00PM. A gill net was set 200m upstream of the bridge and 300m downstream of the bridge on each day for a total of eight sets. The net (70'x 30mesh deep with 4 inch mesh) was set by hand starting on the north side of Williams Creek. The net was fed across to the South side of the creek and drifted downstream approximately 100m before being closed off on the North side of the creek.

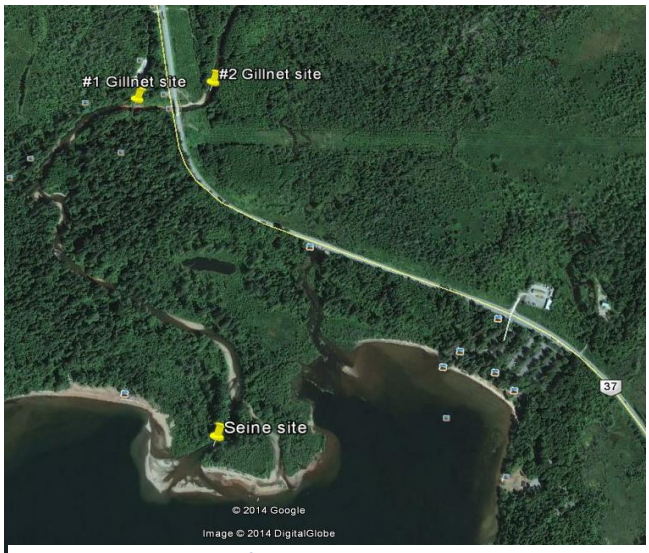

Figure 2: Location of Seining and Gillnetting sites

Figure 3: Pursed seine net with stop net below

Once secured, the Sockeye were quickly removed, assessed and documented based on origin (wild/enhanced-no adipose), sex, maturity, and presence of a gill punch (recaptures) (Figure 5). All captures without a gill punch on the right gill plate were recorded as "new" captures during the gill net sets while all captures with a gill punch on the right gill plate where recognised as recaptures from seining. All captures from gillnetting were hole-punched on the left gill plate to ensure they were not counted again during a subsequent gillnetting session. Data collected from both seining and gill netting has been used to estimate the percentage of enhanced returns from the Fry Outplant Program.

Figure 4: Removing Sockeye from gillnet

Figure 5: Hole-punching the right gill plate to indicate a re-capture if caught again

Figure 6: A marked (enhanced) male

Results - Seining

Males appeared to be more abundant at the beginning of the sampling period. The ratio of females to males increased after mid-August (Table 1). Only 7 jacks were captured during the 7 seining sets, and only late in the sampling period.

Table 1. Sockeye Seining Data

Seining Count	03-Aug	07-Aug	recaps	10-Aug	recaps	14-Aug	recaps	17-Aug	recaps	24-Aug	recaps	02-Sep	recaps
Mk Male	1	29		17	10, 1d	34	5, 1d	19	4	17	1	4	1
Male	60	306	5	98	35	285	13, 5d	223	23, 4d, 1t	332	30, 5d, 1q	80	16, 1d
Mk Female		10		10		18	1	37		36	4, 1d	2	
Female	10	125	2	99	15	316	10, 3d	399	18, 4d	584	48, 2d, 1t	94	19, 1d, 1q
Mk Jack													
Jack										5		2	
Totals	71	470	7	224	60, 1d	653	29, 9d	678	45, 8d, 1t	974	83, 8d, 1t, 1q	182	36,2d,1t

d=double recapture, t=triple recapture, q=quadruple recapture, Mk = Marked (Enhanced/Hatchery)

Seining sample sizes ranged between 71 and 1067 individuals, including recaptures (Table 2). Sample sizes peaked at 1067 individuals during our second to last sampling session (Table 2) and decreased substantially after August 24th, 2015. The number of recaptures in each sample varied from 7 to 93 individuals. Of the 292 recaptures, 28 were double recaptures and 3 were triple recaptures and 2 quadruple recaptures (Tables 1 and 2).

Table 2. Sample Population Total

Seining Total Sample	Aug 3	Aug 7	Aug 10	Aug 14	Aug 17	Aug 24	Sept 2	Total
Sample Total	71	477	285	691	732	1067	221	3,544
Total Recaps*	0	7	61	38	54	93	39	292
Total Less Recaps	**71**	**470**	**224**	**653**	**678**	**974**	**182**	**3,252**

*total includes double, triple and quadruple recaps

The total sample population obtained by seining was comprised of 1,505 males, 1,740 females, and 7 jacks, for a total of 3,252 Sockeye (Table 3). There were 121 marked males, 113 marked females and 0 marked jacks captured over the seven seining events (Table 3). The data for returning Sockeye caught by seining indicates that the enhanced component was approximately 7.2% of the total escapement.

Table 3. Total Marked vs. Unmarked

*Marked vs Unmarked	Male	Female	Jack	Total
Marked	121	113		234
Unmarked	1,384	1,627	7	3,018
***Total**	**1,505**	**1,740**	**7**	**3,252**

*** totals do not include recaptures**
Unmarked = wild

Results – Gillnetting

The ratio of male to female captures were comparative during the eight gill net sets (Table 4). No jacks were captured during any of the eight gill net sets. All recaptures were originally captured during seining; the rest of the sample population was captured for the first time during one of the eight gill net sets (Table 4). Gillnetted recaptures were recorded to prevent double counting, however no additional data was gathered.

Table 4. Sockeye Gill Netting Data

Gill Netting Count	Aug 19				Aug 26				Sept 4				Sept 11			
	Set 1	**recaps**	**Set 2**	**recaps**	**Set 1**	**recaps**	**Set 2**	**recaps**	**Set 1**	**recaps**	**Set 2**	**recaps**	**Set 1**	**recaps**	**Set 2**	**recaps**
Mk Male	2		2	2	2	1	6	1	3	1d		1	1	3		
Male	25	7	24	8, 3d	24	8	23	15, 2d, 1t	26	5, 1t	20	9, 3d	5		6	3
Mk Female		1d	1		2		1	2	1		2			1		2
Female	24	7	36	5	22	8	32	16, 1d	33	4	26	15, 2d	6	1, 1d	12	3d
Mk Jack																
Jack																
Totals	**51**	**14, 1d**	**63**	**15, 3d**	**50**	**17**	**62**	**34, 3d, 1t**	**63**	**9, 1d, 1t**	**48**	**25, 5d**	**12**	**5, 1d**	**18**	**5, 3d**

d= double recapture, t=triple recapture, Mk = Marked (Enhanced/Hatchery)

note - Data does not include gill-netted recaptures (left hole punch)

Sample sizes from each gill net set ranged from 18 to 100 individuals (Table 4). A total of 510 Sockeye were captured during the gill net sampling period, including recaptures, double recaptures and triple recaptures (Table 5). Of the 510 Sockeye, 124 were recaptures, 17 double recaptures and 2 triple recaptures (Table 4/Table 5).

Table 5. Gillnetting Sample Population Total

Gill Netting Total	Aug 19		Aug 26		Sep 4		Sep 11		
	Set 1	Set 2	Set 1	Set 2	Set 1	Set 2	Set 1	Set 2	Total
Sample Total	66	81	67	100	74	78	18	26	**510**
Total Recaptures	14	15	17	34	9	25	5	5	**124**
Total Double and Triple recaps	1	3		4	2	5	1	3	**19**
Total Less Recaps	**51**	**63**	**50**	**62**	**63**	**48**	**12**	**18**	**367**

367 of the 510 Sockeye that were captured during the gill net sampling period were not previously captured during seining. Of the 169 Males, 198 Females, and 0 Jacks: 16 males and 7 females were enhanced fish (Table 6). The data for the gillnet sets indicates that the enhance component was approximately 6.26% of the total escapement.

Table 6. Total Gillnetting Marked vs. Unmarked

Marked vs Unmarked	Male	Female	Jack	Total
Marked	16	7	0	**23**
Unmarked	153	191	0	**344**
Total	**169**	**198**	**0**	**367**

Note - totals <u>do not</u> include recaptures (left hole punch)

Unmarked = wild

Results – Population Estimate

To estimate the population of returning Sockeye to Williams Creek, we used the Lincoln-Petersen equation.

$$N = \frac{Kn}{k}$$

where,

N = number of Sockeye in the population
K = Number of new Sockeye seined
n = Total Number of Sockeye gillnetted
k = Number of recaptures gillnetted

There was a total of 3,252 new Sockeye seined, 510 Sockeye gillnetted, and 143 gillnetted recaptures. This gives us a population estimate of approx. 11,598 Sockeye.

To prevent duplicate counting, all right sided recaptures during seining and left sided recaptures during gillnetting were excluded from the formula.

Discussion/ Recommendations

The 2015 adult sockeye assessment was a success. We improved our methods from the previous year by including a left-sided gill punch for gillnetted sockeye and we continued the sampling into September. We handled over 3,700 fish for an estimate of approximately 11,598 adult returns. The percentage of marked (enhanced) fish represented 7.2% (seining) and 6.26% (gillnetting) of the total escapement to Williams Creek. Based on the seining data, males were more prevalent than females throughout the beginning of the sampling period, but became less prevalent than females at the end. The number of Jacks caught may not represent the total in the system as they may be able to get through the nets due to mesh size.

In 2015 we improved our recapture methods by including a left-sided gill plate punch. This particular gill punch was to indicate sockeye that have been previous gillnetted, and therefore were not counted in consecutive gill net sets. Without the left-sided gill punch, we would have overestimated the returning adult population by approximately 1000 individuals. We had a total of 47 gillnet recaptures (left hole punch).

The contribution of enhanced sockeye was higher in 2015 than in 2014. We believe this to be because in 2015 the escapements consisted of three, four and five year olds whereas in 2014 there were only three and four year olds. Due to lack of funding, the Fry Outreach program was not conducted in 2009 resulting in no returning five year olds for 2014. The contribution of enhanced Sockeye captured from seining in 2014 was 3.3% and in 2015 was 7.2%. Assuming that the number of returning enhanced three and four year olds remains constant (from a release of 300K), the percent increase of 54.1% from 2014 to 2015 suggests that five year olds made up approximately 54.1% of the total enhanced escapement to Williams Creek for 2015.

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Should you require any further information or have any questions or concerns, please do not hesitate to contact me at 250-638-8878.

Sincerely,

Bobbi Vojtko B.Sc.

Sincerely,

Mitch Drewes