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**Hatchery-Wild Interactions
Study 2018 Field Season
Summary**

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1. Project Overview

The scale of the Alaska hatchery programs has raised concerns that hatchery fish may impact the productivity and sustainability of wild stocks of Alaska salmon. Because of the value of both hatchery-origin and wild stocks of Alaska salmon, and the state mandate that hatchery production be compatible with sustainable productivity of wild stocks, the Alaska Department of Fish & Game (ADF&G) and the PNP hatchery corporations have recognized the need for research studies that address the concerns about straying assessment and genetic and ecological interactions between hatchery and wild salmon. In 2011, ADF&G convened a science panel that prioritized three major questions:

- 1) What is the genetic stock structure of chum salmon in Southeast Alaska?
- 2) What is the extent and annual variability in straying of hatchery chum salmon in SE AK?
- 3) What is the impact on fitness (productivity) of wild chum salmon due to straying of hatchery chum salmon?

The Sitka Sound Science Center (SSSC) was contracted by the Alaska Department of Fish & Game in 2017 and 2018 to collect genetic and life history samples from post-spawning summer chum salmon in 4 streams in Northern Southeast Alaska.

In 2018, SSSC field personnel conducted 72 total surveys of 4 streams between July 20th and August 28th. A total of 1,308 post spawning chum were sampled with pre-season sampling objectives met for Fish Creek. Two field crews were established, each focused on 2 streams. Additional samples were collected by other SSSC staff during the same time period. Prior to deployment, crew members spent 5 days in Sitka and Juneau for training and field preparation. Training consisted of field safety, sampling protocols and quality control.

In 2018, SSSC placed an additional staff member in Juneau to act in a support role for the field crew. This additional person was fully trained as a field technician but primarily functioned as support for field operations. By having a support person in Juneau, it allowed the field crew to focus on data collection and the quality of samples collected. All crew members appreciated the support and recommended that we continue to employ a support person in Juneau.

SSSC extended the pre-season training period by one day. The additional time was spent working through data collection and quality control procedures, including working directly with Jon Livermore at DIPAC on scale collection and an additional walk-through of field techniques, data collection, and QA on Fish Creek. This preseason work was supplemented by delivering scale card to DIPAC for analysis after the first days of collection. Jon Livermore was able to review our scale collection process and give us feedback to help improve collection for the remainder of the season.

The *M/V Surveyor* was used to transport and house a vessel-based crew to access Prospect Creek and Admiralty Creek and a Juneau based crew had easy road access to Fish Creek and

use of a skiff to survey Sawmill Creek. Two apartments were rented from the University of Alaska Southeast for the Juneau based crew.



Figure 1. Location of streams used to sample post-spawning Chum salmon in relations to Juneau, AK.

2. Data Collection & Reporting

The quality and integrity of the data was enhanced again in 2018 with a combination of revamping software for both tablets and laptops, enhanced training, additional checks of the data both in the field and the lab, and a focused effort on four pedigree streams.

The edits to both tablet and laptop software allowed for easier data entry and review. The tablet application continues to prompt field crews to double check work at milestones (end of a tray row, end of processing area, etc.) while sampling in the field. The laptop application has been updated to allow for easier review and editing of data and was used after each stream survey. The laptop application prompts a complete review of the samples collected and requires identification of cells with missing information. Once these checks have been completed the application runs a series of quality assurance checks before transmitting the data via the internet. Both crews were asked to back up the data each day to multiple locations and the crew with limited internet access would transmit data when internet connection was available.

The Hatchery-Wild Database was utilized by project personnel throughout the season to produce reports, check data and confirm transmission directly from an online database. This

database was used multiple times during the season to conduct final quality assurance checks prior to delivering otolith and DNA samples to the ADF&G MTA lab and scales to the Douglas Island Pink and Chum lab in Juneau.

3. Sampling Equipment

All sampling equipment worked well in 2018. Crews were sent into the field with knives, forceps, surgical scissors, 48 deep-well plates, impermamats, tray labels, tray jigs, calipers, ethanol and scale cards to conduct sampling. Upgrades were made to several key pieces of equipment including packs and safety equipment. Overall, crew members felt well prepared with the equipment in the field.

Impermamats, tray jigs and labels were provided by Kyle Shedd at the Gene Conservation Lab. Mr. Shedd was a great resource for this project in 2018. The ethanol for the 2018 project was shipped to the MTA Lab and stored at DIPAC by Jon Livermore. Both the MTA lab staff and Mr. Livermore were extremely helpful and flexible with pick-up and delivery of materials and samples.

4. Communication

Communication between field crews and project coordinators was effective. The use of both cell phones and Garmin InReach SE Satellite texting devices allowed crews to remain in contact with the SSSC project coordinator throughout the season. Sample numbers, field logistics, schedule revisions, special circumstances and other topics were discussed as necessary throughout the season. Project coordinators also maintained communications with ADF&G Area Management Biologists in Juneau and Haines with updates about fish numbers, stream and sampling conditions.

5. Results

A. Stream Visits

The Juneau based crew was given a schedule of sampling each stream every other day. In general, this schedule worked well, and the crew surveyed Fish Creek 19 times during the field season and Sawmill Creek was surveyed 17 times.

The *M/V Surveyor* was provided with a loose schedule but in general was asked to survey each stream at least every 3rd day. Additionally, at the beginning of the field season the boat crew was asked to conduct surveys on each stream every other day for 4 days. Both Admiralty and Prospect Creek were visited 18 times.

Overall, the 2018 crews were efficient and thorough in collecting samples. By focusing on just four creeks, each crew was able to conduct thorough surveys across the chum run. Weather did pose a challenge in 2018 for returning salmon. At times, all four creeks had water levels so low that fish struggled to swim beyond the intertidal area. SSSC crews made 72 stream visits and collected 1,308 pedigree samples.

Field crews were able to survey all streams on a regular basis. The Juneau based crew experienced two flood events on Fish Creek and three on Sawmill Creek. The flooding resulted in 4 low quality and/or abbreviated surveys as well as one canceled survey. The crew based on the *M/V Surveyor* reported a single flood event on Admiralty Creek and three flood events on Prospect Creek. Each of these events resulted in abbreviated or low-quality surveys (figure 2).

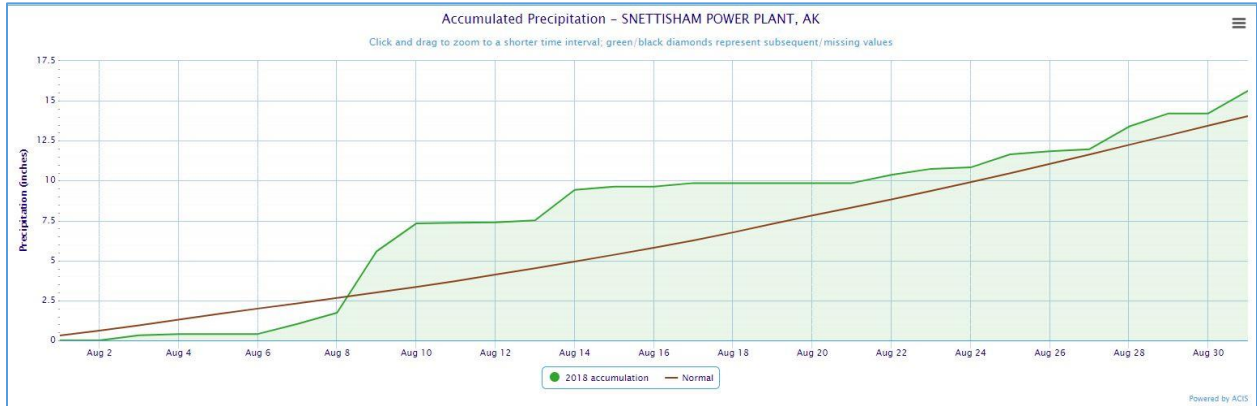
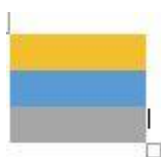


Figure 2. Accumulated Precipitation for Snettisham. Nearly 6" of rain fell in a 48-hour period between August 8-August 10 with a 2nd large event between August 13 and August 15.

Both crews dealt with brief periods of high wind, but it did not affect access to the streams. Fish Creek is accessed by the Juneau road system and Sawmill Creek can be accessed by both land and water, which meant that the crew was able to hike in on days with high winds. The vessel-based crew was able to find protected areas to anchor and so strong winds did not affect the planned survey schedule.

Table 1. Survey schedule and collected samples by stream.



Information highlighted in orange indicates hot & dry weather with low water conditions.

Information highlighted in blue indicates flooding.

Information highlighted in gray indicates jaw samples were collected.

Admiralty Creek (111-41-10050)

DATE	LIVE COUNT	DEAD COUNT	POST-SPAWN SAMPLES
7/22/2018	333	0	0
7/25/2018	193	0	0
7/26/2018	251	0	0
7/29/2018	260	0	0
7/30/2018	255	0	0
8/2/2018	320	0	0
8/3/2018	145	0	0
8/7/2018	678	2	2
8/8/2018	619	8	10
8/11/2018	291	4	2
8/12/2018	408	9	8
8/15/2018	411	5	8
8/16/2018	511	3	4
8/20/2018	101	2	4
8/21/2018	48	1	1
8/24/2018	21	21	21
8/25/2018	16	0	0
8/28/2018	2	0	0

Fish Creek (111-50-10690)

DATE	LIVE COUNT	DEAD COUNT	POST-SPAWN SAMPLES
7/20/2018	266	6	6
7/22/2018	370	8	7
7/24/2018	347	8	8
7/26/2018	239	12	12
7/28/2018	307	36	31
7/31/2018	195	102	96
8/2/2018	281	205	119
8/4/2018	286	209	89
8/6/2018	274	272	87
8/8/2018	189	93	43
8/10/2018	311	86	46
8/12/2018	290	182	102
8/14/2018	217	100	53
8/16/2018	136	190	100
8/18/2018	118	204	88
8/20/2018	65	204	51
8/22/2018	18	259	49
8/24/2018	22	215	23
8/26/2018	7	97	8

Prospect Creek (111-33-10100)

DATE	LIVE COUNT	DEAD COUNT	POST-SPAWN SAMPLES
7/21/2018	305	0	0
7/23/2018	313	1	1
7/24/2018	372	0	0
7/27/2018	446	0	0
7/28/2018	435	2	2
7/31/2018	466	2	2
8/1/2018	496	5	8
8/5/2018	468	12	11
8/6/2018	569	15	15
8/10/2018	188	40	37
8/13/2018	130	7	8
8/14/2018		3	3
8/18/2018	103	3	3
8/19/2018	55	0	1
8/22/2018	110	4	4
8/23/2018	108	18	18
8/26/2018	69	3	3
8/27/2018	58	2	2

Sawmill Creek (115-20-10520)

DATE	LIVE COUNT	DEAD COUNT	POST-SPAWN SAMPLES
7/21/2018	332	2	2
7/23/2018	472	3	3
7/25/2018	439	3	3
7/27/2018	497	4	4
7/30/2018	232	7	7
8/1/2018	252	23	21
8/3/2018	155	26	11
8/5/2018	123	31	19
8/7/2018	98	22	9
8/9/2018	CANCELLED FOR FLOODING		
8/11/2018	37	13	2
8/13/2018	55	5	5
8/15/2018	42	13	9
8/19/2018	8	4	7
8/21/2018	10	6	6
8/23/2018	3	4	2
8/25/2018	1	2	2

Chum Salmon Returns

Live and dead counts of chum salmon in 2018 were significantly lower in 3 of 4 survey streams (Fish, Prospect, Sawmill Creek) compared to 2017. However, Admiralty Creek was reported to have a much larger peak live count in 2018 than in 2017. The dates and peak counts for both 2017 and 2018 are shown in the table 2 below.

Table 2. Chum Salmon peak live counts by stream 2017 vs 2018 (top) peak dead counts (below).

Stream Name	AWC Number	2017 Live Chum Salmon		2018 Live Chum Salmon	
		Date	Peak Count	Date	Peak Count
Admiralty Creek	111-41-10050	7/29/17	354	8/7/18	678
Fish Creek	111-50-10690	7/30/17	1,591	7/22/18	370
Prospect Creek	111-33-10100	8/5/17	1,300	8/6/18	569
Sawmill Creek	115-20-10520	7/29/17	1,174	7/27/18	497

Stream Name	AWC Number	2017 Dead Chum Salmon		2018 Dead Chum Salmon	
		Date	Peak Count	Date	Peak Count
Admiralty Creek	111-41-10050	8/14/17	243	8/24/18	21
Fish Creek	111-50-10690	8/12/17	496	8/6/18	272
Prospect Creek	111-33-10100	8/13/17	534	8/10/18	40
Sawmill Creek	115-20-10520	8/13/17	855	8/5/18	31

The run timing was also similar between 2017 and 2018 in Fish, Prospect, and Sawmill Creek. Admiralty Creek showed a late spike in live chum salmon. Based on similar run timing to 2017, SSSC field crews expected to see an increase in post-spawn chum salmon between August 6-12. Early season low water which held fish back in several streams combined with late season flooding impacted sampling. Due to intense flooding in all survey streams between August 7-10 (figure 2), coinciding with peak spawning activity, the expected post-spawn salmon were not in the streams so could not be sampled by field crew. All survey streams also reported increased and intense bear activity that also could have contributed to the availability of post-spawn samples. The following graphs (Fig. 3- 6) show the live and dead counts of chum salmon over the course of the field season in each stream.

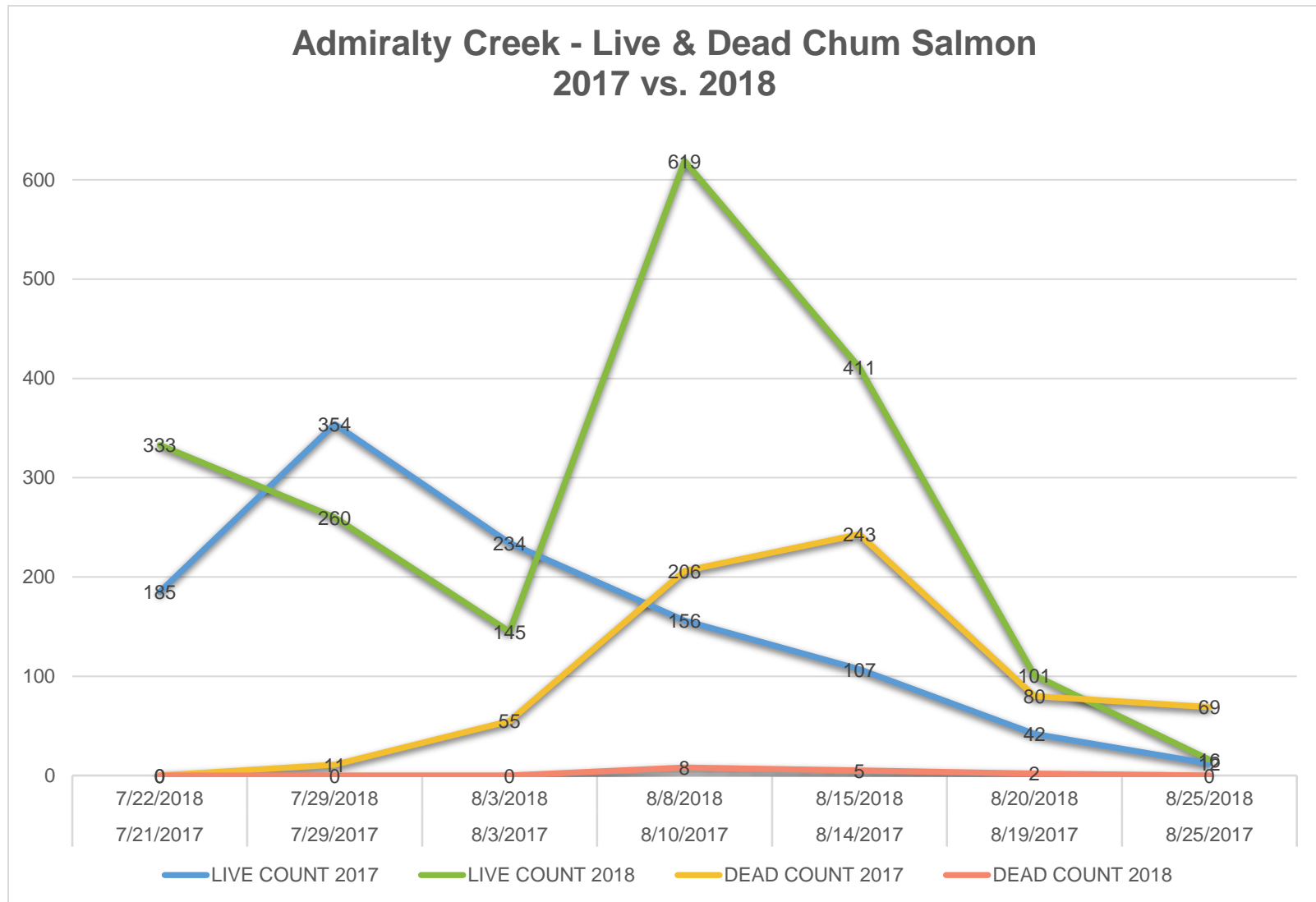


Figure 3. Admiralty Creek live and dead chum salmon counts by date 2017 vs 2018.

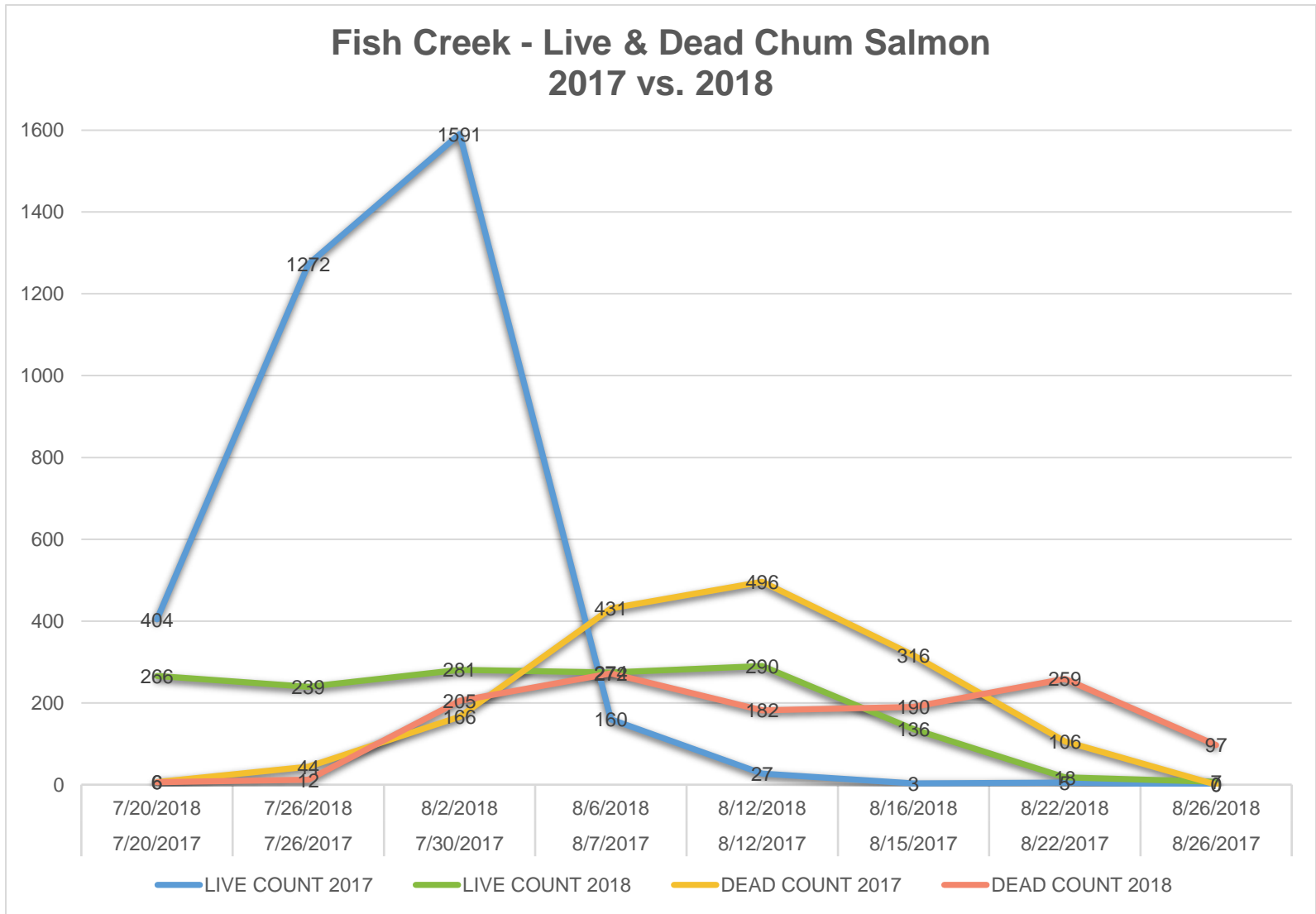


Figure 4. Fish Creek live and dead chum salmon counts by date 2017 vs 2018.

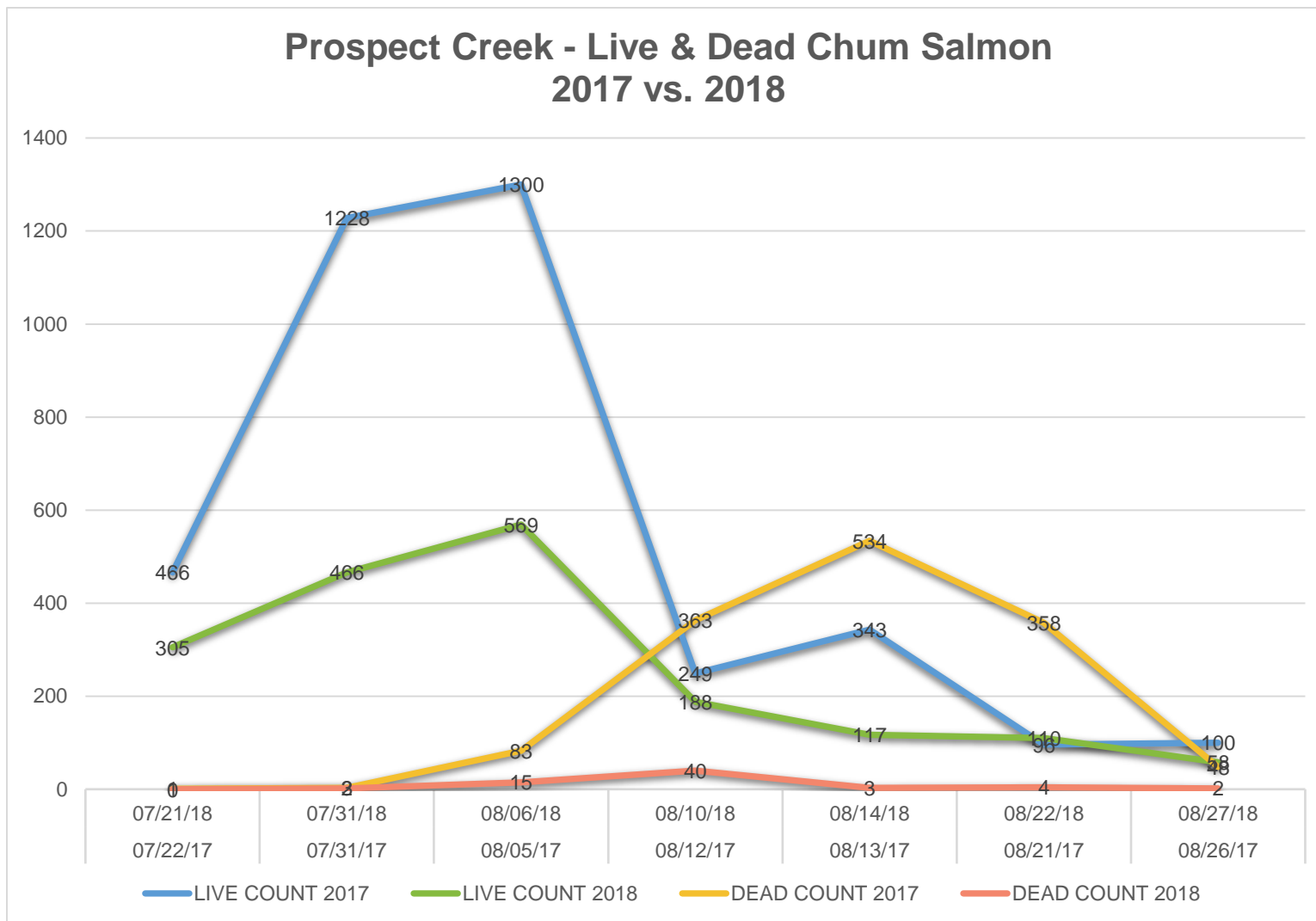


Figure 5. Prospect Creek live and dead chum salmon counts by date 2017 vs 2018.

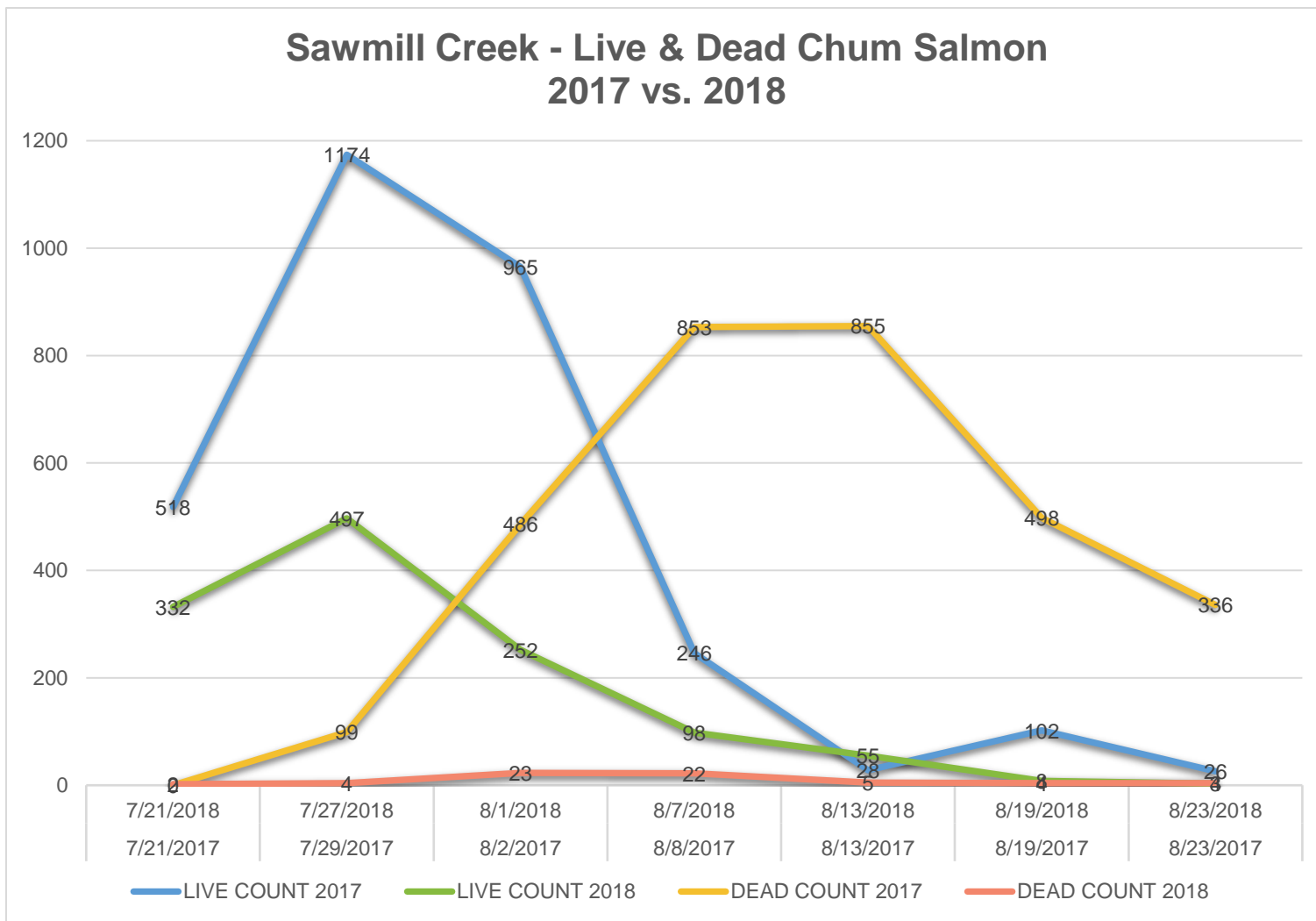


Figure 6. Sawmill Creek live and dead chum salmon counts by date 2017 vs 2018.

SSSC field crews were tasked with collecting a minimum of 500 samples per creek or 60-80% of the total run of chum salmon. The field crews exceeded the 500 fish minimum at Fish Creek but fell below that sample goal in Admiralty, Prospect, and Sawmill Creek. Field crews require post-spawn chum for sample collection. Heavy flooding in all survey creeks likely washed these fish out of the streams so many of these fish were not available for collection. The chart below shows a summary of stream visits and sample collection for each creek.

Stream Name	AWC Number	Target Sample Size	Visits	Post-Spawn Chum Salmon Sampled	% of Peak Live Count Sampled	Otoliths (2 ea.)	DNA	Scales (4 ea.)
Admiralty Creek	111-41-10050	500	18	60	8.85%	75	60	144
Fish Creek	111-50-10690	500	19	1018	275.1%	1915	1015	3972
Prospect Creek	111-33-10100	500	18	118	20.7%	177	118	372
Sawmill Creek	115-20-10520	500	17	112	22.5%	191	112	340
TOTALS		2000	72	1308		2358	1305	4828

In previous years of this project, field crews have collected samples from chum salmon with an intact head. This sampling method allowed SSSC staff to easily differentiate between chum salmon that had been sampled previously or not. In mid-August the field crew based on the *M/V Surveyor* reported intense bear predation on both Admiralty and Prospect Creek. The field crew

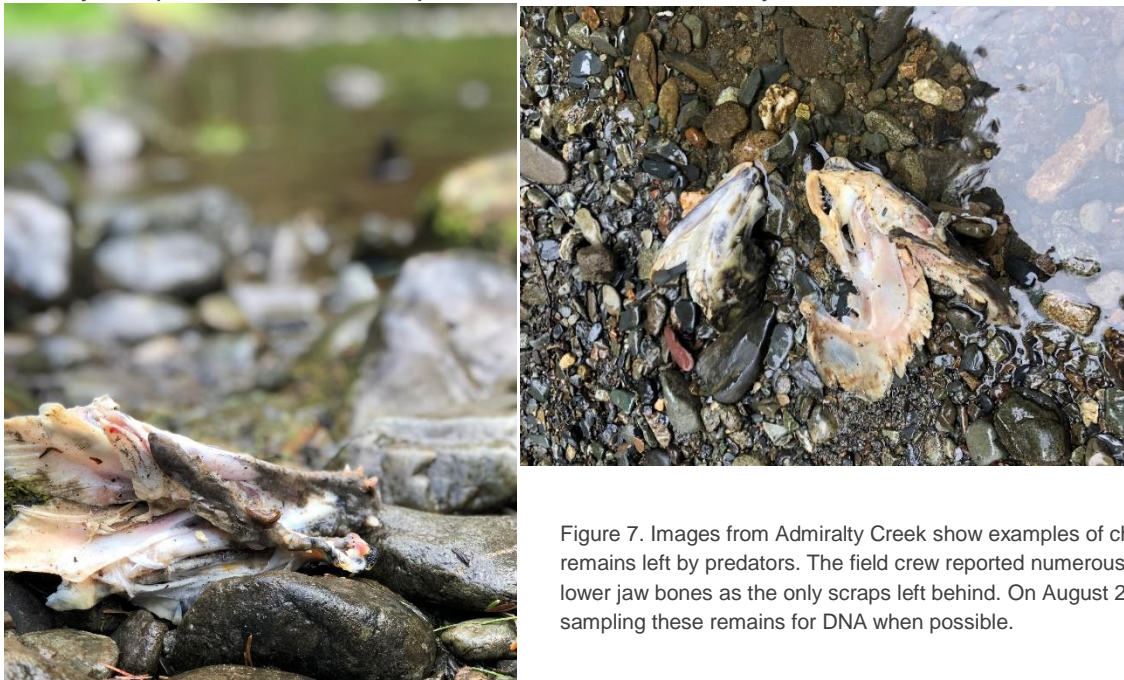


Figure 7. Images from Admiralty Creek show examples of chum salmon remains left by predators. The field crew reported numerous examples of lower jaw bones as the only scraps left behind. On August 23, we began sampling these remains for DNA when possible.

observed few intact carcasses or post-spawn chum salmon in either creek however, the crew began reporting high numbers of chum salmon lower jaws.

Based on conversations with ADF&G and in consultation with the science panel, on August 23 the SSSC field crews began sampling DNA from all chum salmon remains to boost DNA samples (figure 7). The table below shows the number off samples collected using the adjusted sampling method, they are referred to as “Jaw Samples”.

Stream Name	AWC Number	Total Samples	Jaw Samples	% of Total
Admiralty Creek	111-41-10050	60	21	35%
Fish Creek	111-50-10690	1018	0	0%
Prospect Creek	111-33-10100	118	22	18.6%
Sawmill Creek	115-20-10520	112	2	1.8%

The field crew conducting surveys on Admiralty and Prospect Creek reported a single day increase in sample collection based on this adjustment. The jaw samples allowed field crews to collect DNA however, they were not able to collect scales or otoliths from these samples.

SSSC field crews conducted thorough surveys and collected the samples available. While the minimum sampling goal was not met in Admiralty, Prospect, and Sawmill Creek, the lack of samples collected was due to a lack of availability. A combination of extreme weather and high predation left few carcasses and post-spawn chum salmon in the survey streams or intertidal areas.

6. Recommendations

Despite drought then flood weather conditions, small chum returns in 3 streams, and increased bear activity, field crews performed thorough surveys and reported observations in a timely manner that allowed ADF&G and SSSC to make adjusts to sampling procedures. This field season posed challenges not previously experienced during this project. By communicating consistently and documenting field observations we have a solid record of the 2018 field season.

To continue and build on the documentation of field observations, SSSC recommends supplying each crew with a field camera to photo document start and end locations, processing areas, and unusual events. Providing cameras to the field crew would provide SSSC coordinators and ADF&G managers with more visual information. It is also possible that we could work with Resource Data, Inc. (RDI) to build a picture feature into the HWI app that could link photos with a specific point on a given survey.

Finally, we also recommend some minor adjustments to the HWI computer program to help streamline the QA process and make it more user friendly. This should be a simple fix that

would align all collected data into a single viewing screen. Currently the QA process requires reviewers to scroll right to view scale card information. SSSC would like to see otolith, DNA, scale, and morphometric data in an easy viewing format.