



SITKA SOUND SCIENCE CENTER

Hatchery-Wild Interactions Study 2019 Field Summary

November 25, 2019

1. Project Overview

The scale of the Alaska salmon hatchery programs has raised concerns that hatchery salmon may impact the productivity and sustainability of wild stocks. Due to 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) along with the private-non-profit hatchery corporations have recognized the need for research studies that address the concerns about straying assessment and the genetic and ecological interactions between hatchery and wild salmon. In 2011, ADF&G convened a science panel that prioritized three major questions in Southeast Alaska:

- 1) What is the genetic stock structure of chum salmon in Southeast Alaska (SEAK)?
- 2) What is the extent and annual variability in straying of hatchery chum salmon in SEAK?
- 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 ADF&G in 2017 and 2018 to collect genetic and life history samples from post-spawned summer chum salmon in four streams in Northern Southeast Alaska. In 2019, the scope of the project was reduced to more intensely survey three of those four streams in Northern Southeast Alaska

The SSSC field technicians spent six days of training and field preparation in Sitka and Juneau prior to conducting field work. Training consisted of field safety, sampling protocols and quality control. Two field crews were established, one land-based and one vessel-based. In 2019, 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. The support staff in Juneau allowed field crews to focus on data collection and quality of the samples delivered.

The land-based field crew conducted surveys on Fish Creek (Douglas Island) and Sawmill Creek (Berner's Bay) while the vessel-based crew focused on a Prospect Creek (Port Snettisham). In the field, the SSSC fisheries technicians conducted 69 total surveys for the 3 targeted streams in 2019. Field work was conducted between July 20th and August 27th. A total of 3,048 chum salmon were sampled.

The land-based crew was tasked with conducting surveys on Fish Creek (AWC 111-50-10690) and Sawmill Creek (AWC 115-20-10520) in Berner's Bay. Fish Creek is accessed by the road system on Douglas Island and the crew traveled by skiff to Sawmill Creek. Two apartments were rented from the University of Alaska Southeast for the Juneau-based crew. The *M/V Surveyor* was contracted again in 2019 to provide transport and housing for the vessel-based crew and to provide access to Prospect Creek (AWC 111-33-10100). In past years, the *Surveyor* was also used to access Admiralty Creek (AWC 111-41-10050). Due to consistently low sample sizes and extremely difficult surveying conditions, the project science panel decided to remove Admiralty Creek from the study area in 2019.



2. Data Collection & Reporting

The quality and integrity of the data was enhanced again in 2019 through updated protocols, updated field technician training, close coordination with labs, and prompt sample delivery. In 2019 we worked more deliberately to align the field preparation, field work, quality checks of samples, and sample delivery with the project protocols and survey methods.

The updates made to project protocols made it easier to quickly reference key information in the field and access more detailed direction regarding sampling techniques in order to reduce collection errors. The tablet application prompts field crews to conduct quality checks at important sampling milestones (end of tray row, end of processing area, etc.) while collecting samples in the field which also helps minimize collection errors. The laptop application allows for easy review of all field data and was utilized

after returning to base camp. Prior to data transmission, the laptop application prompts a complete review of the samples collected and requires the identification of milestone cells (missing otolith, last specimen, etc.). Once these checks are complete, the survey is transmitted to the Hatchery-Wild Database via the internet. Data was backed up on multiple storage devices daily by both field crews. The vessel-based crew had limited internet access and transmitted surveys as service was available, typically occurring each week.

The Hatchery-Wild Database is utilized by project personnel throughout the season to produce reports, conduct data checks, and confirm survey transmission. The database is also used 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 & Chum lab in Juneau.

3. Sampling Equipment Summary

All sampling equipment worked well in 2019. Crews were sent into the field with:

1. knives,
2. forceps,
3. surgical scissors,
4. 48 deep-well plates,
5. impermamats,
6. tray labels,
7. tray jigs,
8. calipers,
9. ethanol
10. and scale cards to conduct sampling

Additional upgrades were made to several key pieces of equipment including backpacks and safety equipment. Several pieces of equipment were replaced with updated models including GPS and firearms. Additionally, each crew was provided with an additional Garmin InReach communication device to improve the ability to communicate from the field. Overall, crew members felt well prepared and satisfied with the equipment used in the field.

4. Communication

Communication between field crews and the project coordinator was effective and frequent. The use of both cell phones and Garmin InReach SE Satellite texting devices allowed crews to remain in contact with the SSSC project coordinator and field support staff throughout the season. Sample numbers, field logistics, schedule revisions, field crew requests, and other challenges were discussed throughout the season. The Project coordinator also maintained close communications with ADF&G Area Management Biologists in Juneau and Haines with updates on fish numbers, as well as stream and sampling conditions. Weekly updates were also communicated to ADF&G project supervisors and the HWI science panel.

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 and Sawmill Creek a total of 18 times each during the 2019 field season

In 2019, the HWI Science Panel decided to remove Admiralty Creek from the study. The *M/V Surveyor* was asked to support the crew conducting surveys on Prospect Creek. Prospect Creek was surveyed 33 times in 2019.

Overall, the 2019 crews were efficient and thorough in collecting samples. Focusing on three creeks allowed each crew to conduct thorough surveys across the chum summer run in Northern Southeast Alaska. Weather posed a minor challenge in 2019 for returning salmon. At times, all three creeks had extremely low water levels until mid-August due to hot and dry conditions. During the second half of August, field crews experienced several minor flooding events that resulted in abbreviated surveys. Overall, the 2019 field season was successful; SSSC crews made 69 stream visits and collected 3,048 pedigree samples.

Field crews were able to conduct surveys on all streams on a regular basis. The Juneau based crew experienced two flood events on Fish Creek which resulted in 2 abbreviated and/or low-quality surveys. High winds also posed some issues in conducting surveys on Sawmill Creek for the Juneau based field crew but did not result in any cancelled surveys. . The vessel-based crew reported 4 flood events on Prospect Creek that resulted in 3 low quality and/or abbreviated surveys (Table 1).

Table 1. Survey schedule and collected samples by stream

Fish Creek (111-50-10690)

| DATE | LIVE COUNT | DEAD COUNT | POST-SPAWN SAMPLES |
|-----------|------------|------------|--------------------|
| 7/21/2019 | 19 | 0 | 0 |
| 7/23/2019 | 36 | 0 | 0 |
| 7/25/2019 | 200 | 1 | 1 |
| 7/27/2019 | 435 | 1 | 1 |
| 7/29/2019 | 675 | 6 | 7 |
| 7/31/2019 | 901 | 38 | 48 |
| 8/2/2019 | 945 | 104 | 82 |
| 8/4/2019 | 728 | 221 | 152 |
| 8/6/2019 | 393 | 292 | 208 |
| 8/9/2019 | 58 | 385 | 263 |
| 8/11/2019 | 34 | 333 | 177 |
| 8/13/2019 | 21 | 334 | 226 |
| 8/15/2019 | 36 | 854 | 157 |
| 8/17/2019 | 13 | 184 | 187 |
| 8/20/2019 | 7 | 654 | 114 |
| 8/22/2019 | 13 | 595 | 38 |
| 8/24/2019 | 2 | 155 | 9 |
| 8/26/2019 | 11 | 238 | 12 |

Sawmill Creek (115-20-10520)

| DATE | LIVE COUNT | DEAD COUNT | POST-SPAWN SAMPLES |
|-----------|------------|------------|--------------------|
| 7/22/2019 | 21 | 0 | 0 |
| 7/24/2019 | 31 | 0 | 0 |
| 7/26/2019 | 56 | 0 | 0 |
| 7/28/2019 | 110 | 1 | 1 |
| 7/30/2019 | 119 | 4 | 5 |
| 8/1/2019 | 145 | 3 | 4 |
| 8/3/2019 | 91 | 16 | 17 |
| 8/5/2019 | 106 | 19 | 17 |
| 8/8/2019 | 80 | 82 | 58 |
| 8/10/2019 | 63 | 126 | 39 |
| 8/12/2019 | 32 | 156 | 34 |
| 8/14/2019 | 14 | 169 | 27 |
| 8/16/2019 | 8 | 166 | 30 |
| 8/19/2019 | 10 | 99 | 9 |
| 8/21/2019 | 8 | 105 | 9 |
| 8/23/2019 | 4 | 86 | 2 |
| 8/25/2019 | 3 | 47 | 3 |
| 8/27/2019 | 2 | 34 | 3 |

Prospect Creek (111-33-10100)

| DATE | LIVE COUNT | DEAD COUNT | POST-SPAWN SAMPLES |
|-----------|------------|------------|--------------------|
| 7/21/2019 | 37 | 0 | 0 |
| 7/22/2019 | | 0 | 0 |
| 7/23/2019 | 63 | 0 | 0 |
| 7/24/2019 | 87 | 0 | 0 |
| 7/25/2019 | 110 | 1 | 1 |
| 7/27/2019 | 196 | 1 | 1 |
| 7/28/2019 | 73 | 1 | 1 |
| 7/29/2019 | 417 | 16 | 17 |
| 7/30/2019 | 280 | 19 | 4 |
| 7/31/2019 | 419 | 19 | 6 |
| 8/1/2019 | 555 | 6 | 6 |
| 8/2/2019 | 426 | 3 | 5 |
| 8/3/2019 | 515 | 6 | 10 |
| 8/4/2019 | 543 | 8 | 3 |
| 8/6/2019 | 529 | 8 | 12 |
| 8/7/2019 | 583 | 28 | 25 |
| 8/8/2019 | 588 | 36 | 24 |
| 8/9/2019 | 558 | 60 | 27 |
| 8/10/2019 | 580 | 131 | 55 |
| 8/11/2019 | 516 | 132 | 61 |
| 8/12/2019 | 487 | 180 | 49 |
| 8/14/2019 | 190 | 222 | 144 |
| 8/15/2019 | 293 | 337 | 122 |
| 8/16/2019 | 278 | 397 | 70 |
| 8/17/2019 | 116 | 274 | 26 |
| 8/19/2019 | 177 | 266 | 116 |
| 8/20/2019 | 272 | 390 | 100 |
| 8/21/2019 | 305 | 441 | 61 |
| 8/22/2019 | 181 | 324 | 53 |
| 8/24/2019 | 33 | 128 | 24 |
| 8/25/2019 | 97 | 227 | 57 |
| 8/26/2019 | 103 | 201 | 22 |
| 8/27/2019 | 11 | 56 | 6 |

No shading indicates a normal survey
 Blue shading indicates flood conditions
 Orange shading indicates arrival of fall chum

B. Chum Salmon Returns

Chum salmon returns were steady in both Fish Creek and Prospect Creek. However, Sawmill Creek had low chum salmon counts in 2019 as compared to previous years. The chum salmon run occurred slightly later than previous years; initial live counts were extremely low and peak counts were delayed by several days to a week. Due to relatively consistent weather and an overall lack of predation, the dead counts and post-spawn sample numbers were significantly higher compared to 2018 counts.

Table 2. Chum salmon peak live counts by stream in 2017, 2018 and 2019 (above), peak dead counts (below).

| Stream Name | AWC Number | 2017 Live Chum Salmon | | 2018 Live Chum Salmon | | 2019 Live Chum Salmon | |
|-----------------|--------------|-----------------------|------------|-----------------------|------------|-----------------------|------------|
| | | Date | Peak Count | Date | Peak Count | Date | Peak Count |
| Fish | 111-50-10690 | 7/30/17 | 1,591 | 7/22/18 | 370 | 8/2/19 | 945 |
| Prospect | 111-33-10100 | 8/5/17 | 1,300 | 8/6/18 | 569 | 8/8/19 | 588 |
| Sawmill | 115-20-10520 | 7/29/17 | 1,174 | 7/27/18 | 497 | 8/1/19 | 145 |

| Stream Name | AWC Number | 2017 Dead Chum Salmon | | 2018 Dead Chum Salmon | | 2019 Dead Chum Salmon | |
|-----------------|--------------|-----------------------|------------|-----------------------|------------|-----------------------|------------|
| | | Date | Peak Count | Date | Peak Count | Date | Peak Count |
| Fish | 111-50-10690 | 8/12/17 | 496 | 8/6/18 | 272 | 8/15/19 | 854 |
| Prospect | 111-33-10100 | 8/13/17 | 534 | 8/10/18 | 40 | 8/21/19 | 441 |
| Sawmill | 115-20-10520 | 8/13/17 | 855 | 8/5/18 | 31 | 8/14/19 | 169 |

The run timing for all creeks in sample area was similar to previous years but occurred slightly later in 2019 as compared to 2017 and 2018. Based on previous field seasons, SSSC crews expected to see an increase in availability of post-spawned chum salmon between August 2-16 in both Fish Creek and Sawmill Creek and in Prospect Creek between August 8-22. These dates represent a stream life ranging between 10-16 days. Spawn timing did occur during the expected dates and sample collection of spawned individuals increased during the first three weeks of August. Minor flooding in the middle of August led to several abbreviated surveys but did not have lasting impacts on sample collection (Table 1). The below graphs (Figures 3-5) show the live and dead counts for chum salmon along Fish, Sawmill and Prospect Creek during the 2019 field season. The graphs also depict the sample collection (DNA, otoliths and scales) of chum salmon over the course of the field season in each stream.

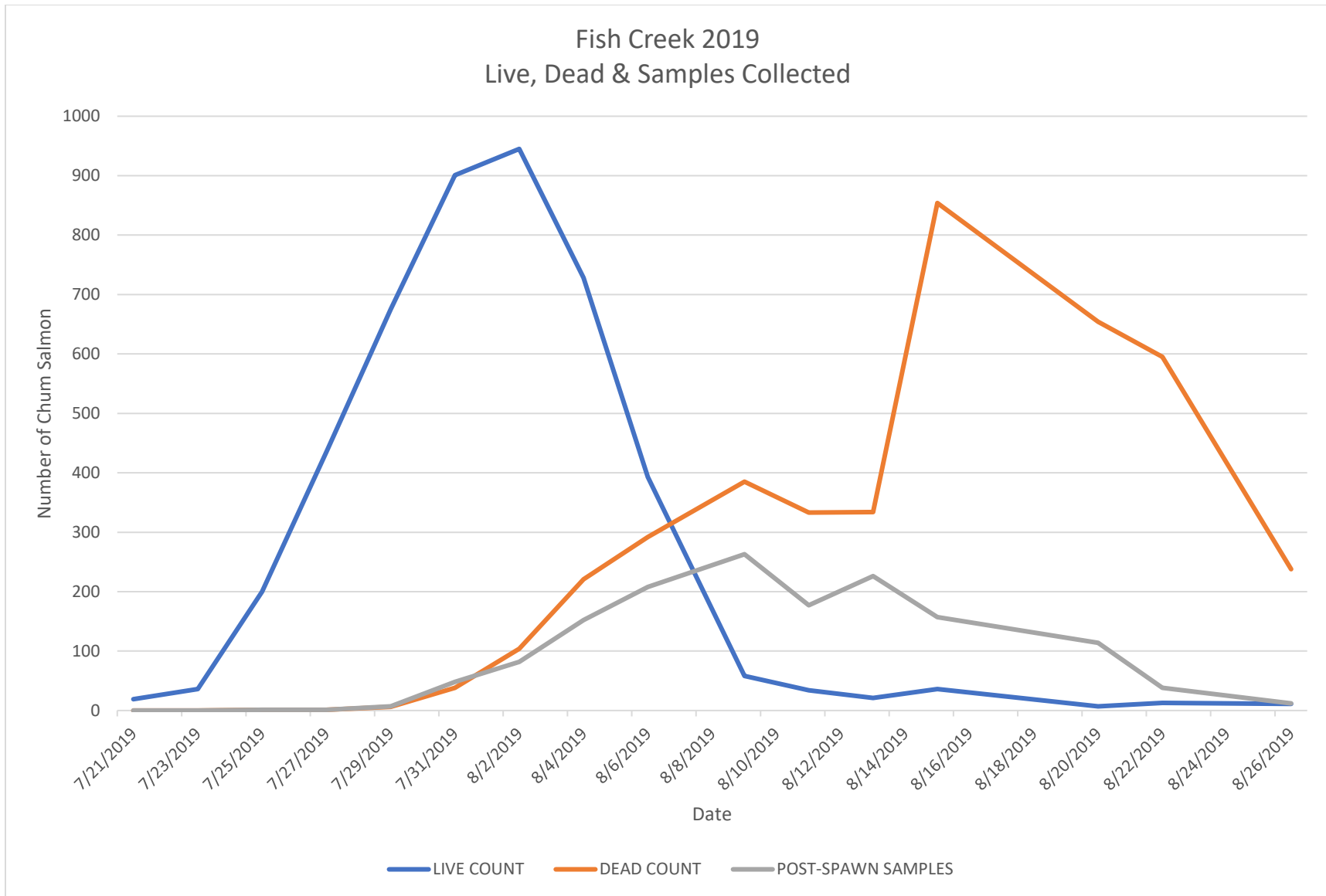


Table 3. Fish Creek live counts, dead counts and samples collected by date 2019.

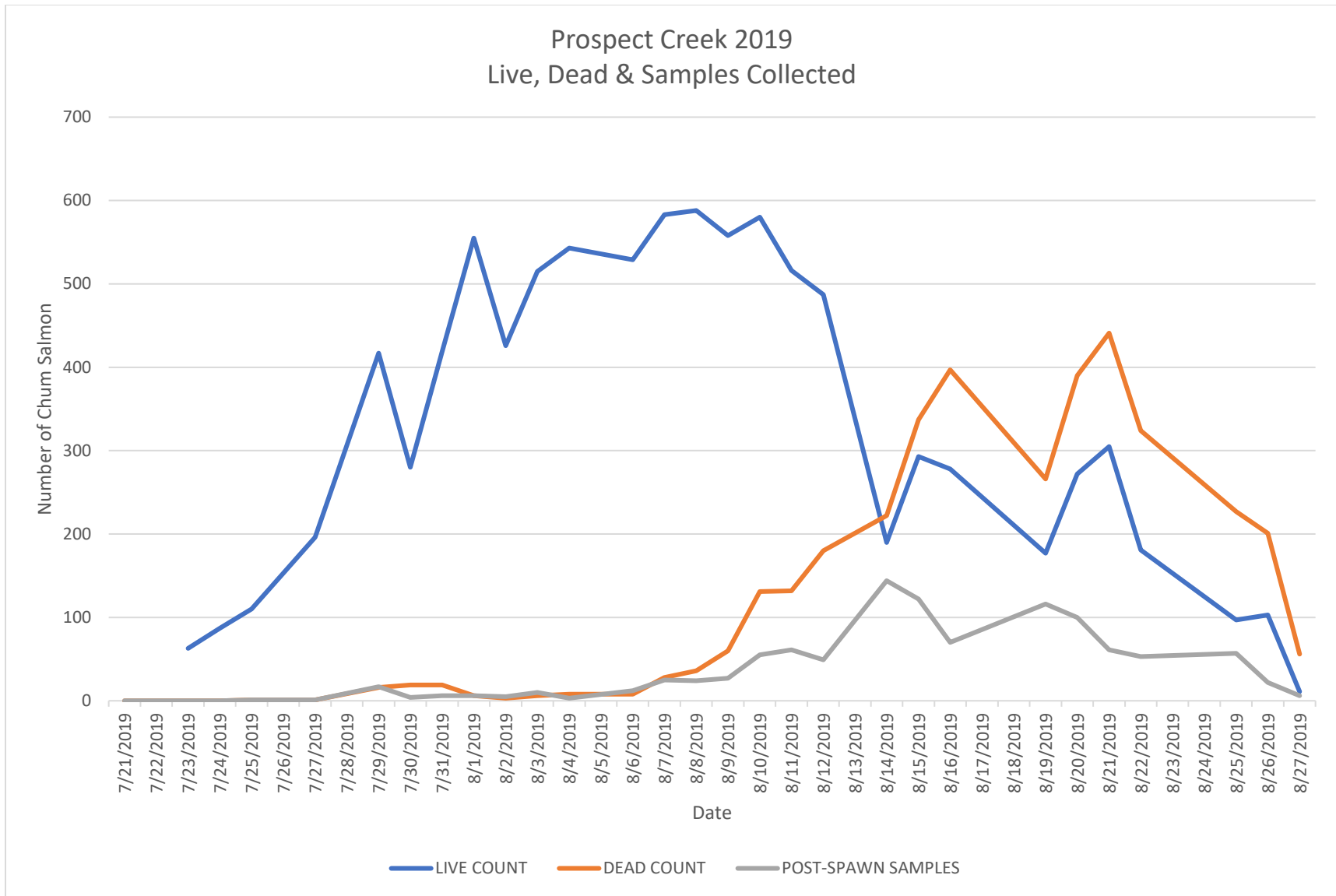


Table 4. Prospect Creek live counts, dead counts and samples collected by date 2019.

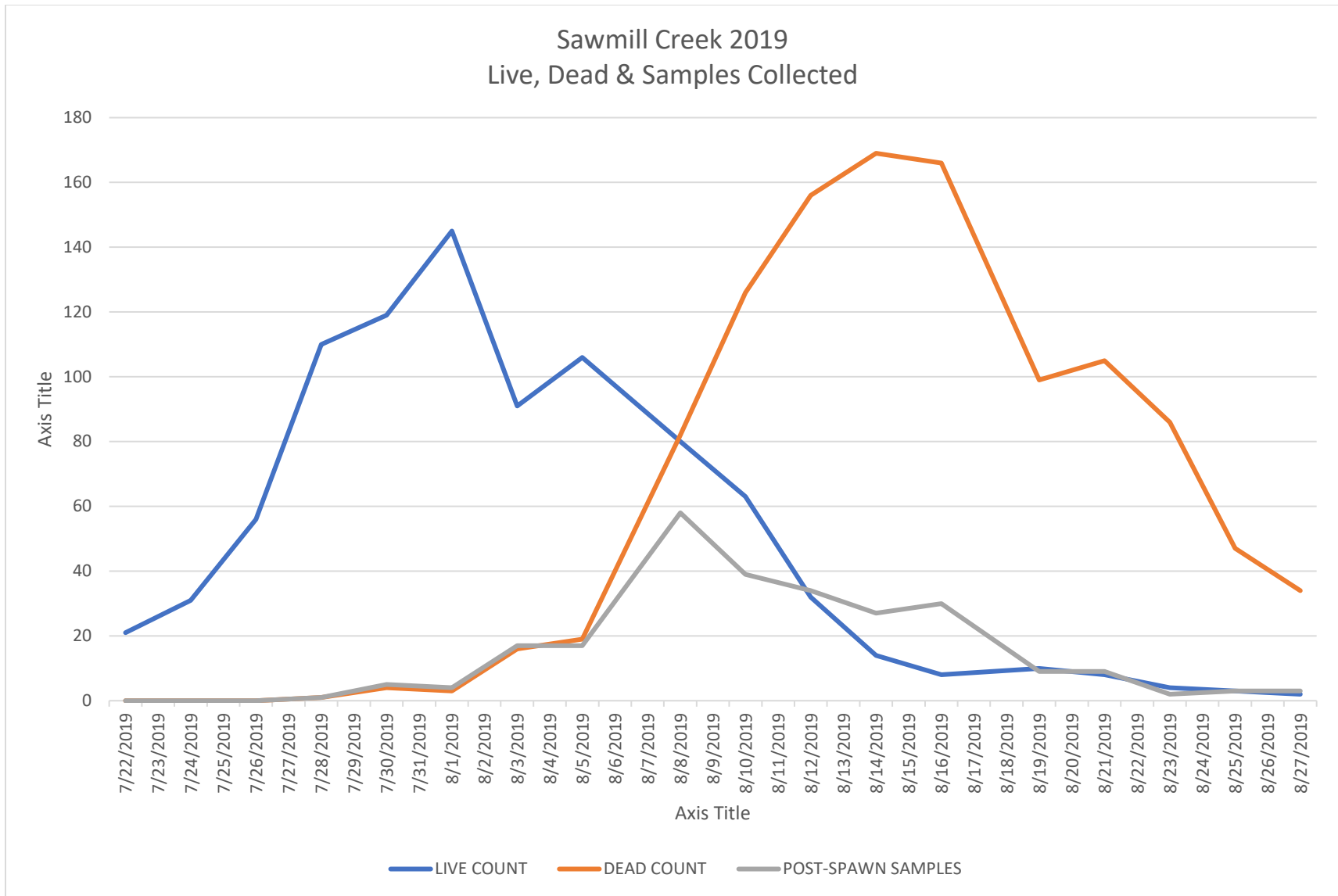


Table 5. Sawmill Creek live counts, dead counts and samples collected by date 2019.

C. Sample Collection

The SSSC field crews target sampling goals were to collect 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 for both Fish Creek and Prospect Creek but fell short of that sample goal for Sawmill Creek. Some of the discrepancies in sample collections could be explained by Sawmill Creek having a recorded small chum salmon return in 2019, with a peak live count of 145 chum salmon as compared to previous years (Table 2). This considered, the total number of samples collected exceeded the peak live counts in all streams. The table below provides a summary of stream visits and sample collection for each creek.

Table 6. Summarizes sample collection and surveys conducted for each creek.

| Stream Name | AWC Number | Target Sample Size | Stream Surveys | Total Samples Collected | Peak Live Count | % of Peak Live Count Sampled |
|----------------|--------------|--------------------|----------------|-------------------------|-----------------|------------------------------|
| Fish Creek | 111-50-10690 | 500 | 18 | 1682 | 945 | 178% |
| Prospect Creek | 111-33-10100 | 500 | 18 | 1108 | 588 | 188% |
| Sawmill Creek | 115-20-10520 | 500 | 33 | 258 | 145 | 178% |

In 2018, field crews experienced extreme weather and intense predation on chum samples. These factors led ADF&G supervisors and HWI Science Panel members to recommend collecting samples from all remains that can be identified as chum salmon. SSSC field crews continued this practice in 2019, though intact carcasses and post-spawn chum salmon were much more readily available for sampling in 2019.

SSSC field crews conducted thorough and complete surveys that spanned each stream within the study area across the entire return. These intense surveys resulted in high data quality and a comprehensive data set. With low water levels for most of the season, a majority of the samples collected came above the intertidal zone due to a general absence of carcasses and post-spawn chum salmon in the intertidal. Field crews continued to survey the intertidal area despite low sample numbers from this zone. Crews also conducted extended surveys on Fish Creek and Prospect Creek periodically. Few fish were observed above the typical survey extent on Fish Creek and low water did not allow fish to progress further up Prospect Creek.

6. Recommendations

Following the 2018 field season, SSSC asked field crews to perform extensive photo documentation of the survey streams. In 2019, photos were taken at the start and end of survey locations, at each processing area, and to document any unusual event. This change in photo protocol documentation led to a greater overall documentation of survey methods, findings, and overall awareness of field conditions.

The SSSC would like to update the HWI computer program prior to the 2020 field season. Several changes could be made to the formatting of the computer program include updating the quality assurance process to help streamline the program and increase user accessibility. The ability to focus on certain data sets will help improve the quality control of data and help to reduce the instance of data

entry errors. The SSSC project coordinator has been working with Resource Data, Inc. (RDI) to keep track of desired changes and can begin making desired alterations in 2020.