

Northern Boundary Area Summer Chum Salmon Monitoring Project 2015: Final Report to the Pacific Salmon Commission Northern Fund

by

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) currently monitors summer chum salmon spawning abundance in 15 index streams in the Boundary Area of southern Southeast Alaska that are assessed primarily through aerial survey methods. ADF&G commercial fisheries managers had expressed concern regarding their ability to obtain reliable counts of chum salmon in some of the large mainland rivers where chum salmon may be masked by high densities of pink salmon, particularly in years of low chum salmon abundance. The primary objective of this project was to conduct helicopter surveys of summer chum salmon on currently monitored river systems in southern Southeast Alaska. Five complete helicopter surveys covering the nine targeted rivers were conducted by three Ketchikan area management biologists and two Petersburg area management biologists in 2015. Additional foot surveys conducted on three smaller chum salmon index systems similarly allowed for direct comparisons with aerial or helicopter survey estimates. In general, management biologists felt their views from helicopter surveys were improved over fixed-wing surveys. As part of the regular chum salmon monitoring program in Southeast Alaska, we recommend that a peak foot survey be conducted during the first week of August at as many of the smaller index streams as funding allows. In addition, a single helicopter survey conducted annually in late July or early August may offer a relatively inexpensive way for managers to help validate their fixed-wing aerial survey chum salmon counts at large mainland river systems.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) currently monitors summer chum salmon spawning abundance in 15 index streams in the Boundary Area of southern Southeast Alaska that are assessed primarily through aerial survey methods (Piston and Heintz 2014). Annual peak survey counts at these streams provide a meaningful indicator of trends in relative abundance, and form the basis of the current lower-bound sustainable escapement goal for southern Southeast Alaska summer chum salmon (Piston and Heintz 2011). High pink salmon abundance in many of these chum salmon index streams, however, can make it difficult to identify chum salmon during routine fixed-wing aerial surveys (Van Alen 2000). This is particularly true of the large mainland river systems where the size of the rivers also makes it difficult to ground-truth aerial survey counts. Although there is broad overlap in run timing of pink and summer-run chum salmon in these rivers, chum salmon tend to spawn earlier in the season than pink salmon (Van Alen 2000), which tend to hold in deeper areas in the lower portions of the river prior to spawning later in the summer.

ADF&G commercial fisheries managers have expressed concern regarding their ability to obtain reliable counts of chum salmon in some large mainland rivers where chum salmon may be masked by high densities of pink salmon, particularly in years of low chum salmon abundance. Improved stock assessment was needed to ensure that perceived low chum salmon abundance was not simply the result of limitations in the methods used to monitor chum salmon, and to provide biologists confidence in their ability to effectively separate chum salmon from more numerous pink salmon on the spawning grounds. The primary objective of this project was to conduct helicopter surveys of summer chum salmon on currently monitored, large mainland river systems south of Wrangell and one index stream on Prince of Wales Island. Helicopter surveys provided surveyors improved views of these streams, and an opportunity to validate observations of chum and pink salmon abundance, identify primary chum salmon spawning areas, and improve managers' ability to identify chum salmon during routine aerial surveys of other index streams in the area. Additional foot and aerial surveys conducted concurrently three smaller chum salmon index systems similarly allowed for direct comparison between methods. Results

from these surveys will guide future chum salmon monitoring in the Boundary Area. Although not a primary focus of this project, baseline pink and chum salmon genetic samples were collected opportunistically while conducting foot surveys.

PROJECT OBJECTIVES

Objective 1. Compare fixed-wing aerial survey counts of chum salmon to helicopter survey counts conducted on eight large mainland chum salmon index streams south of Wrangell and one index stream on Prince of Wales Island.

Objective 2. Compare fixed-wing aerial survey counts of chum salmon to foot survey counts conducted on three smaller southern Southeast Alaska chum salmon index streams during the peak of the chum salmon spawning period.

STUDY SITE

Surveys were conducted at ADF&G summer chum salmon index streams in the Southern Southeast Subregion (SSE) of Southeast Alaska, which extends from Sumner Strait, in the north, to the Canadian border in the south—a distance of approximately 240 km (Figure 1). Fixed-wing aircraft and helicopter surveys were conducted at eight large mainland chum salmon index streams: the Tombstone (ADF&G stream no. 101-15-019), Keta (ADF&G stream no. 101-30-030), Marten (ADF&G stream no. 101-30-060), Wilson (ADF&G stream no. 101-55-020), Blossom (ADF&G stream no. 101-55-040), King (ADF&G stream no. 101-71-04K), Eulachon (ADF&G stream no. 101-75-015), and Harding (ADF&G stream no. 107-40-049) rivers. Fixed-wing aircraft and foot surveys were conducted at two smaller chum salmon index streams: Hidden Inlet (ADF&G stream no. 101-11-101) and Carroll River (ADF&G stream no. 101-45-078). An additional paired foot, helicopter, and fixed-wing aircraft survey was conducted at the Harris River (102-60-082), which is a recently-added chum salmon index stream on Prince of Wales Island.

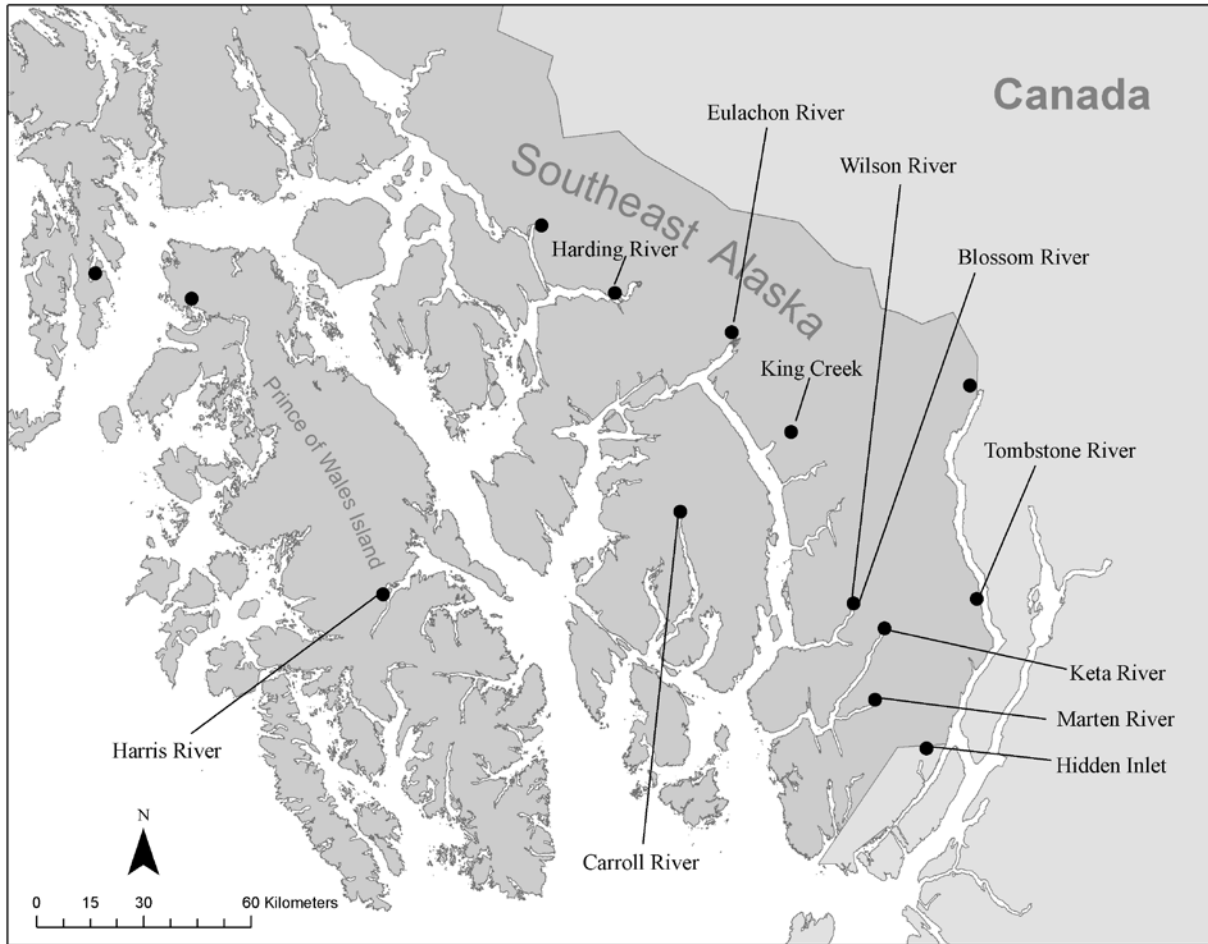


Figure 1.–Southern Southeast Subregion summer chum salmon index streams and index streams targeted for helicopter and foot surveys in 2015.

METHODS

In 2015, comparison of fixed-wing and helicopter surveys were conducted at eight mainland chum salmon index streams in southern Southeast Alaska: the Tombstone (ADF&G stream no. 101-15-019), Keta (ADF&G stream no. 101-30-030), Marten (ADF&G stream no. 101-30-060), Wilson (ADF&G stream no. 101-55-020), Blossom (ADF&G stream no. 101-55-040), King (ADF&G stream no. 101-71-04K), Eulachon (ADF&G stream no. 101-75-015), and Harding (ADF&G stream no. 107-40-049) rivers. An additional paired survey was conducted at the Harris River (ADF&G stream no. 102-60-082) on Prince of Wales Island. Complete fixed-wing aerial surveys were followed by a complete helicopter survey of the same systems the next day (or as soon as possible), and all surveys were timed to coincide with traditional peak chum salmon abundance timing for each river. Aerial surveys were conducted in a Cessna 185 airplane flown at an altitude of 150–200 meters and a speed of approximately 110 km/hour. Helicopter surveys were conducted in a Hughes 500 helicopter following standard survey protocols (Pahlke 1996; Shaul and Tydinco 2006). Observers wore polarized glasses during surveys to reduce glare off the water and optimize visibility. Survey counts, survey conditions (visibility, water levels, weather, and tide stage), and

other pertinent observations were recorded on standardized escapement survey forms, and entered into the Southeast Alaska Integrated Fisheries Database.

Each of the eight targeted mainland rivers was surveyed by helicopter at the traditional peak chum salmon spawning period in 2015. In the Ketchikan Management Area, the first helicopter survey was completed on 4 August 2015 and targeted the Eulachon River and King Creek. A helicopter survey of the Carroll River was also conducted to take advantage of the opportunity while passing by on the way back to Ketchikan. A fixed-wing aerial survey of the Eulachon River and King Creek was conducted on 6 August 2015. The second Ketchikan area helicopter survey was completed on 10 August 2015, covering the Tombstone, Wilson, Blossom, Keta, and Marten rivers. A matched fixed-wing aerial survey of these rivers was conducted on 8 August 2015. In the Petersburg Management Area, fixed-wing aerial surveys and helicopter surveys were conducted by both the area management biologist and the assistant area management biologist on 7 August 2015. An additional paired foot and helicopter survey was conducted at the Harris River on Prince of Wales Island on 20 August.

Comparisons of fixed-wing aircraft and foot surveys were conducted at two smaller chum salmon index streams: Hidden Inlet (ADF&G stream no. 101-11-101) and Carroll River (ADF&G stream no. 101-45-078). Foot surveys were conducted by research staff and available management staff in August as close as possible to regularly scheduled fixed-wing aircraft surveys to provide direct comparison and ground-truth aerial surveys. Hidden Inlet and Carroll River were surveyed twice around typical peak spawning abundance in the first half of August.

RESULTS

HELICOPTER SURVEYS

Helicopter surveys were conducted on 4 August, 7 August, 10 August, and 20 August (Tables 1 and 2). Peak helicopter survey estimates were 8,500 at the Tombstone River, 8,000 at the Keta River, 5,200 at the Marten River, 800 at the Wilson River, 14,500 at the Blossom River, 6,200 at King Creek, 500 at the Eulachon River, and 7,800 at the Harding River (Table 1). Helicopter survey estimates were generally lower or close to the fixed-wing aerial survey estimates for the year at most rivers.

Table 1.–Helicopter and aerial survey chum salmon counts at eight southern Southeast Alaska summer chum salmon index streams, 2015.

Stream	Date	Survey Type	Stream Live	Stream Dead	Total	Observer
Tombstone River	7/25/2015	Aerial	7,000		7,000	B
Tombstone River	8/8/2015	Aerial	15,000		15,000	A
Tombstone River	8/10/2015	Helicopter	6,700	1,800	8,500	B
Keta River	6/30/2015	Aerial	700		700	A
Keta River	7/6/2015	Aerial	1,500		1,500	A
Keta River	7/10/2015	Aerial	6,000		6,000	B
Keta River	7/14/2015	Aerial	5,000		5,000	A
Keta River	7/17/2015	Aerial	3,500		3,500	A
Keta River	8/8/2015	Aerial	10,000		10,000	A
Keta River	8/10/2014	Helicopter	5,800	2,200	8,000	B
Marten River	7/6/2015	Aerial	300		300	A
Marten River	7/10/2015	Aerial	3,000		3,000	B
Marten River	7/17/2015	Aerial	0		0	A
Marten River	8/8/2015	Aerial	5,000		5,000	A
Marten River	8/10/2015	Helicopter	2,200	3,000	5,200	B
Wilson River	6/30/2015	Aerial	250		250	A
Wilson River	7/6/2015	Aerial	1,500		1,500	A
Wilson River	7/10/2015	Aerial	500		500	B
Wilson River	7/14/2015	Aerial	0		0	A
Wilson River	7/17/2015	Aerial	200		200	A
Wilson River	7/22/2015	Aerial	0		0	B
Wilson River	8/6/2015	Aerial	6,000		6,000	A
Wilson River	8/10/2015	Helicopter	800		800	B
Blossom River	7/6/2015	Aerial	500		500	A
Blossom River	7/10/2015	Aerial	1,500		1,500	B
Blossom River	7/14/2015	Aerial	100		100	A
Blossom River	7/17/2015	Aerial	2,000		2,000	A
Blossom River	7/22/2015	Aerial	6,000		6,000	B
Blossom River	8/6/2015	Aerial	18,000		18,000	A
Blossom River	8/10/2015	Helicopter	12,300	2,200	14,500	B
King Creek	7/17/2015	Aerial	7,000		7,000	A
King Creek	7/22/2015	Aerial	4,000		4,000	A
King Creek	8/4/2015	Helicopter	6,200		6,200	B
King Creek	8/6/2015	Aerial	12,000		12,000	A
Eulachon River	7/17/2015	Aerial	1,000		1,000	A
Eulachon River	7/22/2015	Aerial	2,200		2,200	A
Eulachon River	8/4/2015	Helicopter	500		500	B
Eulachon River	8/6/2015	Aerial	4,000		4,000	A
Harding River	7/7/2015	Aerial	300		300	D
Harding River	7/12/2015	Aerial	180		180	E
Harding River	7/20/2015	Aerial	3,000		3,000	D
Harding River	7/24/2015	Aerial	2,500		2,500	E
Harding River	8/7/2015	Helicopter	3,800		3,800	D
Harding River	8/7/2015	Aerial	6,600		6,600	D
Harding River	8/7/2015	Aerial	1,140	50	1,190	E
Harding River	8/7/2015	Helicopter	7,700	100	7,800	E
Harding River	8/7/2015	Aerial	6,600		6,600	D

FOOT SURVEYS

Carroll River

In 2015, four aerial surveys, one helicopter survey, and two foot surveys were conducted by Ketchikan area management and research biologists (Table 2). Foot surveys were conducted on 3 August and 13 August (Table 2). Aerial surveys were conducted 10 July, 14 July (pink count only), 20 July, and 9 August. An additional helicopter survey was flown on 4 August as part of a regular circuit of the targeted mainland rivers. Carroll River offers excellent counting conditions during a foot survey, particularly in the upper half of the river where chum salmon spawning density is highest.

During the first three aerial surveys on 10, 14, and 20 July 2015, the aerial observers saw very few chum salmon in the creek. The first foot survey conducted on 3 August appeared to be right at peak timing and the foot survey counts were both in excess of 10,000 fish (Table 2). The following day a helicopter survey was conducted and the observer estimated 16,000 live chum salmon. The helicopter survey included area above where foot surveyors turned around and it was thought that the general assessment of relative abundance was similar between the two survey methods.

Hidden Inlet

In 2015, three aerial surveys of Hidden Inlet were conducted by two Ketchikan area management biologists and two foot surveys were conducted by Ketchikan area research biologists. Foot surveys were conducted on 4 and 15 August (Table 2) and aerial surveys were conducted 25 July, 8 August, and 19 August. Hidden Inlet is a relatively small, clear stream that offers excellent counting conditions during a foot survey with few areas for chum salmon to avoid detection. Counts by foot surveyors were very similar between observers and between survey dates. During the first foot survey both observers estimated approximately 1,400 live chum salmon and during the second foot survey counts had dropped very slightly to approximately 1,350 chum salmon, with most fish spawning and more carcasses observed. The first two aerial observer estimates were approximately double the foot survey estimates, but include fish counted above the foot survey index area. The final fixed-wing aerial survey on 19 August resulted in an estimate of similar numbers of live and dead chum salmon in the creek, which matched the overall timing assessment from the foot surveys and indicated that most fish were actively spawning by mid-August. All surveys indicated that the chum salmon escapement at Hidden Inlet was average in 2015.

Harris River

In 2015, paired helicopter and foot surveys were conducted at the Harris River on 20 August. The helicopter survey observer estimated 7,000 live chum salmon in the river, which matched the two foot surveyor estimates almost exactly. The helicopter surveyor's estimated number of dead chum salmon, however, was over five times higher than the foot surveyor estimate. The foot survey began approximately 0.5 km above the bridge Hydaburg Road bridge on the upper river and ended approximately 7 miles downriver at the Harris River Road bridge just above intertidal. The helicopter survey continued down through intertidal, but very few chum salmon were observed in the lower river and no chum salmon were observed in the intertidal section.

Although the Harris River is a very long system, virtually the entire system is easily walked and the visibility is excellent under normal or low water levels.

Table 2.– Aerial and foot survey counts of chum salmon at three southern Southeast Alaska summer chum salmon index streams (Carroll River, Hidden Inlet, and Harris River), 2015.

Stream	Date	Survey Type	Stream Live	Stream Dead	Total	Observer
Carroll River	7/10/2015	Aerial	1		1	B
Carroll River	7/14/2015	Aerial	No Chum Salmon Observed			A
Carroll River	7/20/2015	Aerial	100		100	A
Carroll River	8/3/2015	Foot	12,300	33	12,333	F
Carroll River	8/3/2015	Foot	10,400	33	10,433	G
Carroll River	8/4/2015	Helicopter	16,000		17,500	B
Carroll River	8/9/2015	Aerial	9,000	1,000	10,000	A
Carroll River	8/13/2015	Foot	7,200	290	7,490	H
Carroll River	8/13/2015	Foot	4,200	290	4,490	F
Hidden Inlet	7/25/2015	Aerial	3,500		3,500	B
Hidden Inlet	8/4/2015	Foot	1,400	20	1,420	F
Hidden Inlet	8/4/2015	Foot	1,350		1,350	G
Hidden Inlet	8/8/2015	Aerial	3,000		3,000	A
Hidden Inlet	8/15/2015	Foot	1,190	187	1,377	H
Hidden Inlet	8/15/2015	Foot	1,150	187	1,337	F
Hidden Inlet	8/19/2015	Aerial	2,000	2,000	4,000	B
Harris River	7/9/2015	Aerial	25		25	A
Harris River	7/30/2015	Aerial	5,000		5,000	B
Harris River	8/5/2015	Aerial	10,000		10,000	A
Harris River	8/14/2015	Aerial	10,500	500	11,000	B
Harris River	8/20/2015	Foot	6,750	863	7,613	F
Harris River	8/20/2015	Foot	7,330	863	8,193	H
Harris River	8/20/2015	Helicopter	7,000	5,000	12,000	C

Genetic Sampling

In 2015, we collected pink salmon tissue samples from a set of streams on Prince of Wales Island that were accessed on the trip to survey Harris River: Big Creek Red Bay (20), Eagle Creek (200), El Capitan East Side (25), Wolf Creek N El Capitan (204), 108 Creek (209), Exchange Cove Creek (201), Alder Creek (202), and Staney Creek (6). All of these samples are for future use in genetic baselines for Southeast Alaska. Tissue samples are archived at the ADF&G Gene Conservation Laboratory, Anchorage.

DISCUSSION

The helicopter and foot surveys conducted in the first four years of this project have been invaluable for giving management and research biologist increased confidence in chum salmon index counts to SSE boundary area streams. In 2013, pink salmon returned to southern Southeast Alaska in record numbers (highest escapement index and 2nd highest harvest on record). In 2014 pink salmon escapements were again very strong in southern Southeast Alaska; the index value for the East Behm Canal stock group, where most of the targeted streams for this project are located, was the 4th highest since 1960. Without the helicopter and additional foot surveys

conducted for this project, management biologists would have been uncertain about wild chum salmon escapements at many index streams. Without these extra surveys it may have been assumed that large numbers of chum salmon were missed during aerial surveys due to masking by pink salmon in both 2013 and 2014. The first four years of this project have provided radically different counting conditions and additional years would be beneficial to help current managers see the full range of variation in combined chum/pink salmon escapement sizes.

Two additional index streams were identified during the first three years of this project, including one that was determined to be suitable for conducting long-term foot and aerial surveys (Harris River). These streams (Eulachon River, Harris River) were added to the Southern Southeast Subregion summer chum salmon escapement index during the February 2015 Alaska Board of Fisheries meeting, and the escapement goal for chum salmon in the Southern Southeast Subregion was updated to reflect the addition of these streams (Piston and Heintl 2014). The Southern Southeast Subregion escapement index now consists of 15 summer-run chum salmon streams in the Boundary Area that are assessed primarily through aerial survey methods.

Foot surveys of smaller streams were extremely valuable for ground-truthing aerial survey estimates and may offer the best opportunity for obtaining reliable and consistent chum salmon index counts, particularly for smaller streams with large, overlapping pink salmon runs. Chum salmon tend to move quickly to spawning riffles in smaller Southeast Alaska streams and can be easily picked out from more numerous pink salmon during foot surveys, even on years of very high pink salmon abundance. At the conclusion of this project (additional years pending), it is recommended that a peak foot survey be conducted during the first week of August at as many of the smaller index streams as funding allows. In addition, a single helicopter survey conducted annually in late July or early August may offer a relatively inexpensive way for managers to help validate fixed-wing aerial survey chum salmon counts at large mainland river systems.

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APPENDIX A

Appendix A 1.–Financial statement of expenditures, 2015.

Site / Project Costs	Description	Project Budget	Actual Expenditures
Travel	Small plane charters for conducting foot surveys at Hidden Inlet and Carroll River, 8 hours @\$675/hr.	\$6,000	\$6,210
	Helicopter charters for conducting surveys at Keta, Marten, Blossom, Wilson, and Tombstone rivers, 24 hours @\$1000/hr.	\$15,900	\$11,102
	Fixed-wing aerial survey of Disappearance Creek (southern Southeast Alaska fall chum salmon index stream; allowed direct comparison with foot survey).		\$945
	Ferry to Prince of Wales Island for Harris River survey.	\$500	\$488
	Per diem for Prince of Wales survey trip.		\$88
	Campsite for Harris River survey and genetic sample collections		\$154
	Barge charter to deliver helicopter fuel to remote storage site near targeted rivers.	\$4,000	\$4,000
Helicopter Fuel	Helicopter Fuel, 550 gallons at \$3.31/gallon	\$1,125	\$1,822
Small Tools & Equipment	Misc, supplies	\$875	\$932
Total Site / Project Costs		\$28,400	\$25,741

Total expenditures for the 2015 Northern Boundary Area summer chum salmon monitoring project came in just below the overall budget. Costs for small plane charters to Hidden Inlet and Carroll River were very close to what we anticipated and costs for the helicopter surveys came in below expectations. We also funded an extra fixed-wing survey of fall chum salmon in Cholmondeley Sound in southern Southeast Alaska, which allowed for comparison with foot surveys at this important Northern Boundary Area fall-run chum salmon stock. Overall, we ended the season with preliminary estimate of approximately \$2,660 remaining in our budget for the 2015 season.