

Calibration of Visual Assessment Methods for Fraser River Sockeye Salmon (*Oncorhynchus nerka*)

Interim Report

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INTRODUCTION

In 2011, the Southern Boundary Restoration and Enhancement Fund (SEF) funded the third of a multi-year calibration study to minimize bias in visually enumerated Sockeye salmon populations in the Fraser River watershed. A detailed summary of the first two years of the calibration study (2007, 2010) is presented in Welch et al. 2011. The following is an interim report summarizing the 2011 calibration activities. An updated summary report of all calibration efforts through 2012 will be provided to the Southern Boundary Restoration and Enhancement Fund Committee in May 2013.

BACKGROUND

The enumeration of Fraser River Sockeye salmon (*Oncorhynchus nerka*) spawning escapements have historically followed a well established two-tiered protocol developed by the former International Pacific Salmon Fisheries Commission (IPSFC). An abundance threshold of 25,000 spawners determined the methodology employed, with low precision visual techniques for escapements less than 25,000, and high precision techniques (fences, DIDSON or mark-recaptures) for escapements greater than 25,000. Decreasing financial resources coupled with larger spawning escapements led to an increase in the abundance threshold from 25,000 to 75,000 spawners in 2004. As a result, visual methods are now being used to enumerate much larger populations than the technique was intended for. The standard expansion factor currently applied to visual counts to account for the consistent underestimation of live counts was developed for small clear stream populations in the Fraser River system. Its application to larger stream populations and lake spawning populations will lead to substantial negative bias in spawning estimates. As the proportion of the total Fraser Sockeye salmon escapement that is enumerated using visual techniques increases, it is crucial that structured calibration studies are undertaken at various locations and Sockeye densities to develop a set of indices that can be applied to a broad suite of populations.

In 2011, calibration efforts focused on three stream populations with greater than 25,000 spawners; two large sized, clear systems (Upper Pitt River system and Adams River) and one medium sized, clear system (Stellako River).

METHODS

In 2011, high precision mark-recapture studies were conducted at the Upper Pitt, Stellako and Adams rivers (DFO funded). For the purpose of calibration, low precision aerial counts (live and dead) were conducted at the peak of spawn in all three systems. Simultaneous ground surveys were paired with the aerial surveys at all three locations to permit the direct comparison of the two counting methods. Population-type specific indices were generated by dividing the high precision mark-recapture estimate by the peak aerial count (live plus dead). A more detailed description of the methods employed in this study is presented in Welch et. al., 2011.

RESULTS

Upper Pitt River

One paired aerial and ground survey of the Upper Pitt River system was conducted over a three day period from September 6th-8th with a total of 21,414 and 22,978 Sockeye salmon (live + dead) enumerated, respectively. The index generated from comparing the aerial count to the system mark-recapture estimate of 56,006 Sockeye salmon is 2.62 (Table 1). The aerial live count was 93% of the simultaneous ground count (Table 2).

Stellako River

One paired aerial and ground survey of the Stellako River was conducted over a two day period from September 29th-30th with a total of 28,490 and 29,313 Sockeye salmon (live + dead) enumerated, respectively. The index generated from comparing the aerial count to the mark-recapture estimate of 85,628 Sockeye salmon is 3.01 (Table 1). The aerial live count was 97% of the simultaneous ground count (Table 2).

Adams River

Two aerial surveys of the Adams River were conducted October 12th and 17th with a total of 14,010 and 12,345 Sockeye salmon (live + dead) enumerated, respectively. The index generated from comparing the peak aerial count (October 12th flight of 14,010) to the mark-recapture estimate of 148,169 Sockeye salmon is 10.58 (Table 1). One paired aerial and ground survey was conducted on October 17th. The aerial live count (12,345) was 75% of the simultaneous ground count (16,393) (Table 2).

Table 1. Summary of low and high precision estimates and the resulting indices at Upper Pitt, Stellako and Adams rivers, 2011.

Stream	Low Precision		High Precision		Index
	Method	Count ^a	Method	Estimate	
Upper Pitt	Aerial	21,414	M/R	56,006	2.62
Stellako	Aerial	28,490	M/R	85,628	3.01
Adams	Aerial	14,010	M/R	148,169	10.58

^a. Peak live count plus dead carcasses observed.

Table 2. Summary of simultaneous aerial and ground live counts at Upper Pitt, Stellako and Adams rivers, 2011.

Stream	Aerial Count	Ground Count	Aerial : Ground (%)
Upper Pitt	21,414	22,978	93%
Stellako	28,490	29,313	97%
Adams	12,345	16,393	75%

SUMMARY

In summary, Sockeye calibration activities were conducted on three systems in 2011 representing two of the eleven stream population types of interest (Welch et. al 2011); two large, clear systems (Upper Pitt River system and Adams River) and one medium, clear system (Stellako River). Low precision visual estimates (aerial live counts) were compared to high precision mark-recapture estimates at all three locations. Additionally, simultaneous aerial to ground counts were conducted in all three systems to compare the two counting methods.

Since targeted calibration efforts began in 2007, twelve calibrations on four of the eleven stream population types of interest have been conducted on Fraser Sockeye. Although this represents significant progress towards the development of population-type specific indices, significant gaps still exist. As annual calibration opportunities are limited, continued calibration work over the long term is required at various locations and Sockeye densities to develop a set of indices that can be applied to a broad suite of populations throughout the Fraser watershed.

REFERENCES

Welch, P., Benner, K. and Leaf, B. 2011. Calibration of Assessment Methods for Fraser River Sockeye Salmon (*Oncorhynchus nerka*) Spawning Populations (25,000 to 75,000). Report prepared by Fisheries and Oceans Canada for the Pacific Salmon Commission, Southern Boundary Restoration and Enhancement Fund.