

SSP 2013 Final Report

I. PROJECT IDENTIFIERS

Project Number: SSP-2013-7 COOP-14-023

Project Title: Estimating the Terminal Run Size of Driver Stocks in Southeast Alaska Fisheries, 2013

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Duration of Project: May 1, 2013 through December 31, 2014

II. PROJECT SUMMARY

Chinook salmon originating from streams and hatcheries on the West Coast of Vancouver Island (WCVI) and North Oregon Coast (NOC) represent a large portion of all Chinook salmon harvested in Southeast Alaska (SEAK) (CTC 2012). Individual stocks within each of these areas are grouped and collectively considered “*driver stocks*” in managing ocean fisheries under the Pacific Salmon Treaty. Obtaining accurate and precise escapement estimates (terminal run size or spawning abundance) for driver stocks has been problematic for aggregate stock groups, but estimating harvest of driver stocks in ocean fisheries has been shown to be more successful (Bernard et al. 2014).

Genetic stock identification provides accurate and precise harvest estimates for driver stocks in SEAK fisheries (Gilk-Baumer et al. 2013). Driver stock harvest estimates from SEAK fisheries can be expanded by terminal recovery ratios of coded-wire tagged (CWT) indicator stocks to ostensibly provide accurate and precise estimates of aggregate escapement for each driver stock (Bernard et al. 2014). This method of estimating escapement (termed the *driver stock method*) relies on the *gorilla assumption*—tagged salmon from the CWT indicator stock have the same harvest and maturation rates as the untagged salmon from their respective driver stocks. The driver stock method was used to estimate the 2013 terminal run size of Chinook salmon for WCVI and NOC stock aggregates. Estimates of hatchery- and natural-origin terminal runs for each driver stock, as well as estimates of natural escapement to the NOC stock aggregate are presented herein.

III. APPROACH

The goal of this project was to estimate the terminal run sizes of aggregate stocks of natural and hatchery-origin Chinook salmon from two stock groups [West Coast Vancouver Island (WCVI) and North Oregon Coast (NOC)] such that the estimates have a CV of no more than 15% and the estimator is asymptotically accurate. Further, aggregate natural escapement to NOC was to be estimated¹. To achieve this goal the following objectives were to be met:

1. Sample Chinook salmon individuals from Southeast Alaska fisheries as follows:

¹ Because Robertson Creek Hatchery, the indicator stock for WCVI, is not applicable to natural WCVI runs due to terminal harvest management, natural escapement cannot be estimated for this stock.

- a. Sample 2,000 individuals (includes 800 individuals from normal catch sampling plus an additional 1,200 individuals) from recreational fisheries in Sitka and Craig over the entire 2013 season,
- b. Sample approximately 1,100 individuals (normal catch sampling) from commercial summer troll fisheries in the Northern Outside and Southern Outside quadrants during 2013.
2. Analyze all samples for genotypes at the 13 microsatellite loci approved for use in analysis of Pacific Salmon Treaty fisheries.
3. Collect the information necessary for the analysis as follows:
 - a. Identify individuals originating from the WCVI and NOC stock groups by individual assignment based on genotypes and baseline allele frequencies,
 - b. Extract and read otoliths from identified individuals from the WCVI stock group captured in recreational fisheries to identify hatchery and natural-produced individuals,
 - c. Use CWTs and adipose clips to identify hatchery-origin fish from the NOC stock group,
 - d. Determine ages of individuals from the two stock groups,
 - e. Determine the harvests of the fisheries from which the samples came.
4. Implement the method described below to estimate the following:
 - a. The terminal run to the WCVI stock group using samples from the recreational fisheries,
 - b. The terminal run to the NOC stock group using samples from the summer commercial fisheries and the recreational fisheries,
 - c. The aggregate escapement for natural-origin fish from the NOC stock group using samples from the summer commercial fishery and the recreational fishery.

IV. RESULTS, EVALUATION AND CONCLUSIONS

A. Project results and findings.

Harvest sampling of Chinook salmon in Southeast Alaska troll and sport fisheries began in May 2013 and continued through September 2013. Because the commercial harvest allocation for Southeast Alaska Chinook salmon was fulfilled during the first retention period of the summer troll fishery in July, no second retention period occurred. Thus, sample sizes are approximately half of that expected for those fisheries. Samples from troll and sport fisheries were returned by October 2013. Of the 2,918 Chinook salmon sampled and genotyped, 2,793 were used in the genetic analyses. Of these, 2,163 were assigned to a stock aggregate with a 95% probability or greater. Otolith and age analyses were completed by May 2014.

The 2013 estimates of terminal run size for each of the driver stocks are given in Table 1. The results reported herein assume the gorilla assumption was met; that is, maturation and exploitation rates were equal between target and CWT indicator stocks.

Table 1.—Estimated hatchery, natural and aggregate terminal run size for West Coast Vancouver Island (WCVI) and North Oregon Coastal (NOC) driver stocks in 2013 (point estimates and CVs) from SEAK summer troll and sport fisheries.

Stock	Ages	Terminal Run					
		Hatchery		Natural		Total	
		Point	CV	Point	CV	Point	CV
WCVI ^{a,b}	3 – 6	113,014	>12%	10,543	>10%	123,558	>12%
	4 – 6	37,693	>15%	4,859	>14%	42,552	>14%
NOC	3 – 6	18,868	44%	97,484	27%	116,352	23%
	4 – 6	18,868	44%	84,337	27%	103,205	23%

^a Point and CV estimates for WCVI are preliminary because CWT recoveries from the Southwest Vancouver Island Net fishery were not available at the time of this report.

^b Reported CVs for WCVI are noted as >X% because bootstrapped variances for the proportion of hatchery and natural by fishery and age have not been calculated because the data are not yet available.

The preliminary estimate of the aggregate terminal run size for ages 3 – 6 WCVI Chinook salmon was 123,558 (CV >12%). Driver stock estimates of natural escapement compared favorably to independent estimates from monitored fisheries in WCVI and with escapement indices (Table 2). Final estimates with corresponding CVs will be presented in Peterson et al. (in prep).

Table 2.—Comparison of driver stock estimates of terminal run size and aggregate escapement for WCVI driver stock in 2013 to reported statistics on total mortality (TM) and escapement.

	Hatchery	Natural	Total
WCVI driver stock estimate for ages 3 – 6	113,014	10,543	123,558
Reported TM for ages 3 – 6 ^a			37,920
Escapement estimate from driver stock method using subtraction			85,638
Reported 14-Stream index ^b		15,255	

^a From Table 1.8 (ISBM TM) in TCCHINOOK(14)-2

^b As reported in Figure 2.18 of TCCHINOOK(14)-2

The preliminary estimate of the aggregate terminal run size for ages 3 – 6 NOC Chinook salmon was 116,352 (CV = 23%). Unlike in 2012, an estimate of age-3 fall Chinook salmon was directly calculable for natural-origin fish. After adjusting for landed catch and incidental mortality, the driver stock estimate of spawning escapement for ages 3 – 6 natural-origin NOC Chinook was substantially lower than the estimate reported from normative agency methods (99,500; CTC 2014), and likely underrepresents the actual escapement for this group in 2013.

Table 3.—Comparison of driver stock estimates of terminal run size and aggregate escapement for NOC driver stock in 2013 to reported statistics on total mortality (TM) and escapement.

	Hatchery	Natural	Total
NOC driver stock estimate for ages 3 – 6	18,868	97,484	116,352
Reported TM for ages 3 – 6 ^a			38,972
Escapement estimate from driver stock method using subtraction			77,380
Escapement estimate from normative method ^b		99,500	
Estimated escapement Nehalem, Siuslaw, Siletz rivers ^c		44,145	

^a From Appendix Table A.22 in TCCHINOOK(14)-2 [CTC 2014] preliminary value

^b From p. 132 in TCCHINOOK(14)-2 [CTC 2014]

^c From p. 184, 206 and 224 (ISBM TM) in TCCHINOOK(14)-2 [CTC 2014]

B. Detail which project objectives were achieved, not achieved, or partially met.

Estimate the terminal run sizes of aggregate stocks of natural- and hatchery-origin Chinook salmon from two stock groups—WCVI and NOC—such that the estimates have a CV of no more than 15% and the estimator is asymptotically accurate.

The objective of estimating terminal run size of natural- and hatchery-origin Chinook salmon for WCVI and NOC has been achieved. Preliminary estimates of total terminal run size for each driver stock had preliminary CVs less than 25%. The accuracy of the estimates depends on the validity of the gorilla assumption, which was assumed to be valid for the estimates reported.

C. Describe significant modifications made.

No changes to the objectives were necessary.

D. Describe any additional or future work to accomplish the project objectives.

The results of this project will be reported in the ADF&G Regional Information Report (Peterson et al. *in prep*), and is expected in 2016.

E. Summary and Conclusion.

This project estimated the terminal run size of natural- and hatchery-origin Chinook salmon from two stock groups: WCVI and NOC. These stock aggregates are important production groups, and obtaining precise and accurate escapement estimates for these stocks is important for the management of Chinook salmon fisheries under the Pacific Salmon Treaty.

V. PRODUCTS

Progress and final reports describing project results and fulfillment of project objectives have been submitted to the funding coordinator. Project results will be submitted as an Alaska Department of Fish and Game Regional Information Report, and is expected in 2016. A progress report was presented to the U.S. CTC during the project review at the

December 2013 meeting.

VI. REFERENCES

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VII. KEY WORDS

Chinook salmon, Southeast Alaska, stock composition, driver stock, terminal run size