

McLoughlin Creek Enhanced Chum Assessment Project Year 5 of 6

Final Report to the Northern Endowment Fund Committee

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INTRODUCTION

Production from the Heiltsuk Community Economic Development Project (CEDP) hatchery in Bella Bella, B.C. has sustained the McLoughlin Creek Chum stock to a point where it has been able to consistently support both a commercial and food, social and ceremony (FSC) harvest in recent years. Starting in brood year 2008, production from this facility was doubled to 2 million fry releases. Returns in subsequent years suggested outer coast chum may be surviving at a higher rate than inner coast chum stocks. Through a low cost fin clipping program, this project will estimate the enhanced contribution to catch of marked brood years as well as survival rates for this stock upon completion of year six. This data will inform both hatchery production as well as fishery management decisions for both inner and outer central coast chum stocks. Years 1 and 2 of this project consisted solely of juvenile salmon marking; years 3 consisted of marking as well as low-cost escapement and fishery sampling. Year 4 and 5 consisted solely of escapement and fishery sampling.

PROJECT OBJECTIVES

This project's primary objective for Year 5 was to conduct sampling in the Area 7 commercial chum fishery and to assess the escapement to McLoughlin Creek. From this work we are able establish incidence of marked returning adults as well as age composition and consequently, are able to estimate the enhanced contribution to the commercial fishery and escapement by the 2011 (age 5), 2012 (age 4) and 2013 (age 3) broods.

METHODS

In the late summer and early fall of 2016, both the Area 7 commercial fishery and the escapement were sampled for mark rate, as well as for age composition. The small size of the spawning creek and limited distribution of chum spawners allow for stream walks and use of a carcass weir by hatchery staff for the sampling of adult spawners in the escapement. All adults removed from the creek for broodstock were examined for marks and records kept of unmarked and marked adults by sex. These fish were not introduced back into the creek so could not be examined twice. Adults that died in the creek, either pre-spawn or post-spawned were examined for marks and cut in two as part of the dead-pitch program. The information was recorded and used to obtain mark incidence of the escapement and an estimate of total escapement to the river. Scale samples for ageing were collected from both marked and unmarked adults.

JO Thomas and Associates Ltd. was contracted to provide sampling of commercial seine and gillnet fisheries in Area 7 that were likely to intercept McLoughlin chum. The 2016 return was the third year with expected returns of marked chum released from McLoughlin hatchery (2011, 2012, and 2013 brood years). McLoughlin chum are targeted in near-terminal fisheries in Area 7. Sampling of catch from Area 7

chum fisheries targeted a 20% sampling rate to calculate a precise mark rate estimate. Biological sampling was also conducted to calculate an estimate of age composition of the catch. Sample data was coupled with an estimate of total catch and escapement to estimate total return of marked fish by age class. Using this data, an estimate enhanced contribution to catch and escapement was calculated. The methodologies used follow a standard set of procedures that DFO has used successfully at Snootli Creek hatchery since 1978 to estimate survival and enhanced contribution to harvest for Area 8 chum.

RESULTS

Juvenile Chum Marking

Brood years 2011 to 2013 made up the marking portion of this multi-year project. Returns in 2016 would be expected from brood years 2011 (5 year olds) and 2013 (3 year olds), with the majority being from brood year 2012 (4 years olds).

Table 1 – 2011 McLoughlin Creek brood year releases.

	Marked	Unmarked	Totals	Mark rate
Seapen Release	-	1,911,520	1,911,520	0%
Hatchery Release	161,622	-	161,622	100%
Total Release	161,622	1,911,520	2,073,142	7.80%

Table 2 - 2012 McLoughlin Creek brood year releases.

	Marked	Unmarked	Totals	Mark rate
Seapen Release		1,707,284	1,707,284	0.00%
Hatchery Release	146,657		146,657	100.00%
Total Release	146,657	1,707,284	1,853,941	7.91%

Table 3 - 2013 McLoughlin Creek brood year releases.

	Marked	Unmarked	Totals	Mark rate
Seapen Release		1,632,860	1,632,860	0.00%
Hatchery Release	168,786		168,786	100.00%
Total Release	168,786	1,632,860	1,801,646	9.37%

Adult Assessment - 2016 Area 7 Chum Fishery

A total of 62,105 chum were recorded as catch in the fishery which spanned statistical weeks 075 through 093 (Table 4). Of the total catch, 6,957 chum were sampled for marks during weeks 91 – 93 and 61 were found to be marked, indicating a mark rate of 0.88% in the catch (Table 5). A total of 240 fish were sampled and processed for age, of which 234 were successfully read (Tables 6-8).

Table 4 - 2016 Area 7 commercial chum fishery total catch and sample data.

Statistical Week	Area	Gear	Catch	Sample Size	Sample Rate
075	7	Seine	-	-	0.00%
		Gill Net	2,358	-	0.00%
		Total	2,358	-	0.00%
081	7	Seine	2,216	-	0.00%
		Gill Net	5,912	-	0.00%
		Total	8,128	-	0.00%
082	8 (Area 7 fishery)	Seine	4,749	-	0.00%
		Gill Net	3,128	-	0.00%
		Total	7,877	-	0.00%
091	7	Seine	15,418	1,463	9.49%
		Gill Net	15,196	3,441	22.64%
		Total	30,614	4,904	16.02%
093	7	Seine	-	-	0.00%
		Gill Net	13,128	2,053	15.64%
		Total	13,128	2,053	15.64%
Total	7	Seine	22,383	1,463	6.54%
		Gill Net	39,722	5,494	13.83%
		Total	62,105	6,957	11.20%

Table 5 – 2016 Area 7 commercial chum fishery mark rate.

Sample Size	Criteria	Marked Male	Marked Female	Marked Unknown	Total Marked
6,957	Number of Marked	14	26	21	61
	Mark rate	0.20%	0.37%	0.30%	0.88%

Table 6 - 2016 Area 7 commercial chum fishery age composition (marked and unmarked combined).

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	31	2013	97	41.45%
	41	2012	117	50.00%
	51	2011	20	8.55%
Total			234	100%

Table 7 - 2016 Area 7 commercial chum fishery age compositions (marked fish).

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	31	2013	24	60.00%
	41	2012	12	30.00%
	51	2011	4	10.00%
Total			40	100%

Table 8 - 2016 Area 7 commercial chum fishery age compositions (unmarked fish).

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	31	2013	73	37.63%
	41	2012	105	52.12%
	51	2011	16	8.24%
Total			194	100%

The hatchery reported a harvest estimate of 1,000 chum for FN FSC fisheries. No sampling occurred on this catch and the catch data is not incorporated into this report.

Adult Assessment - 2016 Escapement

There were a total of 2,222 adults examined for marks during broodstock collection and 1,799 during dead-pitch. A total mark rate of 7.87% was estimated for the escapement (Tables 9 & 10). During dead-pitch, 149 scale samples were collected with a mix of male, female, marked and unmarked and processed to generate a profile of age class composition (Tables 11-13).

Table 9 – 2016 McLoughlin Creek chum escapement mark samples.

Source	Males Unmarked	Males Marked	Females Unmarked	Females Marked	Unknown Sex & Mark	Grand Total
Broodstock	958	90	1,080	94	0	2,222
Deadpitch	819	74	737	49	120	1,799
Total	1,777	164	1,817	143	120	4,021

Table 10 - 2016 McLoughlin Creek chum escapement mark rate.

Source	Male Mark Rate	Female Mark Rate	Total Mark Rate
Broodstock	8.59%	8.01%	8.28%
Deadpitch	8.29%	6.23%	7.33%
Total	8.45%	7.30%	7.87%

Table 11 – 2016 McLoughlin Creek chum river return **total** age composition (marked and unmarked combined) in deadpitch.

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	21	2014	1	0.7%
	31	2013	112	75.2%
	41	2012	31	20.8%
	51	2011	5	3.4%
Total			149	100%

Table 12 – 2016 McLoughlin Creek chum river return **unmarked** age composition in deadpitch.

Species	Gilbert-Rich	Brood	Frequency	Percentage
Chum	21	2014	1	1%
	31	2013	53	78%
	41	2012	14	21%
Total			68	100%

Table 13 – 2016 McLoughlin Creek chum river return **marked** age composition in deadpitch.

Species	Gilbert-Rich	Brood	Frequency	Percentage
Chum	31	2013	59	72.8%
	41	2012	17	21.0%
	51	2011	5	6.2%
Total			81	100%

Table 14 – Summary of contribution to the 2016 Area 7 commercial fishery from McLoughlin Creek chum enhancement of brood years 2011, 2012 and 2013.

2016 AREA 7 FISHERY	
2016 Catch	62,105
2016 Catch Mark Samples	6,957
2016 Catch Mark Rate	0.88%
2016 Catch @ age 5 percentage	41.45%
2016 Catch @ age 5 estimate	25,743
2016 Catch @ age 5 marked	227
2016 Catch @ age 5 mark rate	0.37%
2016 Catch @ age 4 percentage	50.00%
2016 Catch @ age 4 estimate	31,053
2016 Catch @ age 4 marked	273
2016 Catch @ age 4 mark rate	0.44%
2016 Catch @ age 3 percentage	8.55%
2016 Catch @ age 3 estimate	5310
2016 Catch @ age 3 marked	47
2016 Catch @ age 3 mark rate	0.080%

2011 ENHANCED CONTRIBUTION TO 2016 FISHERY	
2016 Catch @ age 5 marked	227
2016 Catch @ age 5 enhanced	2910
2016 Catch - enhanced contribution by 2011 brood	4.69%

2012 ENHANCED CONTRIBUTION TO 2016 FISHERY	
2016 Catch @ age 4 marked	273
2016 Catch @ age 4 enhanced	3451
2016 Catch - enhanced contribution by 2012 brood	5.56%

2013 ENHANCED CONTRIBUTION TO 2016 FISHERY	
2016 Catch @ age 3 marked	47
2016 Catch @ age 3 enhanced	502
2016 Catch - enhanced contribution by 2013 brood	0.81%

TOTAL ENHANCED CONTRIBUTION TO 2016 FISHERY	
2016 Catch - estimated marks	547
2016 Catch - estimated enhanced	6863
2016 Catch - enhanced contribution	11.05%

Table 15 – Summary of contribution to the 2016 McLoughlin Creek chum escapement by enhancement of brood years 2011, 2012 and 2013.

2016 ESCAPEMENT	
2016 Escapement Estimate	4,721
2016 Escapement Observed Mark Rate	7.9%
2016 Escapement @ age 5 composition	3.4%
2016 Escapement @ age 5 escapement estimate	161
2016 Escapement @ age 5 marks	13
2016 Escapement @ age 5 mark rate	8.1%
2016 Escapement @ age 4 composition	20.8%
2016 Escapement @ age 4 estimate	982
2016 Escapement @ age 4 marks	77
2016 Escapement @ age 4 mark rate	7.8%
2016 Escapement @ age 3 composition	75.2%
2016 Escapement @ age 3 estimate	3,550
2016 Escapement @ age 3 marks	279
2016 Escapement @ age 3 mark rate	7.9%
2011 ENHANCED CONTRIBUTION TO 2016 ESCAPEMENT	
2016 Escapement @ age 5 marked	13
2016 Escapement @ age 5 enhanced	167
2016 Escapement - enhanced contribution	3.5%
2012 ENHANCED CONTRIBUTION TO 2016 ESCAPEMENT	
2016 Escapement @ age 4 marked	77
2016 Escapement @ age 4 enhanced	973
2016 Escapement - enhanced contribution	20.6%
2013 ENHANCED CONTRIBUTION TO 2016 ESCAPEMENT	
2016 Escapement @ age 3 marked	279
2016 Escapement @ age 3 enhanced	2,978
2016 Escapement - enhanced contribution	63.1%
TOTAL ENHANCED CONTRIBUTION TO 2016 ESCAPEMENT	
2016 Escapement - estimated enhanced	4,118
2016 Escapement - estimated enhanced contribution	87.2%

DISCUSSION

This is the third year that adult chum from the adipose fin-clipped marked brood years (2011, 2012 and 2013) returned to McLoughlin Creek. Complete estimates of brood-year-specific enhanced contribution to catch and escapement is available for the 2011 brood as all cohorts have recruited to the fishery and escapement from this brood year. Data from previous years indicates this spawning population was comprised predominantly of 4-year-old adults; however, in 2016, 3-year-old chum were observed at higher levels than expected, especially in the escapement.

The area 7 commercial fishery sampling indicated the catch was predominantly comprised of three and four year olds (41% and 50% respectively). Brood years 2011- 2013 provided an estimated 11% of the Area 7 commercial catch (2013 = 0.80%, 2012=5.56% and 2011=4.67%). This strong 3-year-old return in the commercial catch is not reflected in neighbouring areas. Area 8 chum fishery (to the south) was dominated (72%) by 4-year-olds. The age distribution of chum caught in the Area 7 net fishery may be impacted by net size, and run timing. This hypothesis would need more investigation.

Sampling of the escapement indicated the spawning population was dominated by 3-year-olds. Approximately 75% of the river-returns were from the 2013 brood year. This trend is not reflected at the Snootli Creek Hatchery. At Snootli, 4-year olds dominated the return. Often, a strong 3-year-old returns is indicative of a strong cohort. Data collected in 2017 will provide further data to investigate this.

In 2014, 2015 and 2016, a higher rate of enhanced contribution to the terminal escapement was observed, compared to the fishery. This seems logical as the fishery was likely comprised of mixed stocks, thus lowering the frequency of McLoughlin chum. Escapement sampling shows enhanced contribution to the 2015 escapement to be 100%. In 2016, it was 87%. The high level of enhanced contribution in McLoughlin Bay Cr is likely the result of the difference release strategies between marked and unmarked fish. All unmarked fish in brood years 2011-2014 were released from seapens; all marked fish were released from the hatchery.

The 2014 adult data allowed us to detect an issue which still needs to be addressed upon completion of the final year of this project. Any marked fish in the 2014 fisheries would be from 2011 as this was the first year chum were fin clipped and thus could return as 3 year olds. However, 21% of marked fish were determined to be 4 years olds. This is due to either natural fin loss, mis-identification of fin status in fishery and escapement samples, or errors in scale ageing. This could be problematic when trying to estimate contribution of enhancement from specific brood years. This occurred again in 2015 and 2016 but to a much lesser degree with 3.3% of marked fishery catch being aged at 5 years (in 2015) and less than 1% of marked fish in the deadpitch were 2-year olds. Investigation of this is ongoing.

APPENDIX
Financial Expenditures Summary

The total PSC funding for this project was \$19,700. A summary of expenditures is provided below.

Funding Total	\$ 19,700.00
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Contract for Area 7 chum fishery sampling	\$ 17,430.00
Hiring of field supervisor	\$ 1,000.00
Travel cost for supervisor & DFO staff	\$ 1,200.00
Returned to CRF (consolidated revenue fund)*	\$ 70.00
Total Costs	\$ 19,700.00

* Amounts less than \$100 are deposited into general revenue.

Balance	\$ -
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