

McLoughlin Creek Enhanced Chum Assessment Project Year 4 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 at Bella Bella has sustained the McLoughlin Creek Chum stock to a point where it has been able to consistently support both a commercial and FSC harvest in recent years. Starting in brood year 2008, production from this facility was doubled to 2M fry releases. Returns in recent years have 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 survival and enhanced contribution of this stock, which can 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. Only assessment portions will occur in years 4 to 6 to complete assessment of marine survival.

Project Objectives

This project primary objective for this year was to conduct sampling in the Area 7 commercial chum fishery and assessment of the escapement to McLoughlin Creek to establish incidence of marked returning adults for estimation of the enhanced contribution to the commercial fishery and escapement by the 2011 (age 4) and 2012 (age 3) broods.

Methods

In the late summer and early fall of 2015, both the Area 7 commercial fishery and the escapement were sampled for mark rate, as well as for age composition. Given the small size of the spawning creek and limited distribution of chum spawners, stream walks and use of a carcass weir by hatchery staff allow for a large and temporally representative sample of adult spawners. All adults removed from the creek for broodstock are examined for marks and records kept of unmarked and marked adults by sex. These fish are not introduced back into the creek so cannot be examined twice. Adults that die in the creek, either pre-spawn or post-spawned are examined for marks and cut in two as part of the dead-pitch program. The information is recorded and used to obtain mark incidence throughout the run and an estimate of total escapement to the river. Scale samples for ageing are collected from both marked and unmarked adults.

During broodstock collection and carcass dead-pitch of the 2015 adults, 130 scale samples were collected and processed to generate a profile of age class composition. The scale sampling program costs were absorbed by the CEDP contract and DFO.

JO Thomas was contracted to provide sampling of commercial seine and gillnet fisheries in Area 7 that were likely to intercept McLoughlin chum. 2015 was the second year with expected returns of marked chum released from McLoughlin hatchery (2011 and 2012 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. Due to the nature of the terminal spawning grounds, mark rate sampling of escapement at a level >20% is feasible. Biological sampling of both catch and escapement allowed for an estimate of age composition in both samples. 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 of survival and enhanced contribution to catch can be 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. Adult returns from the 2013 brood would be expected between 2016 (age 3) and 2018 (age 5) with most returning at age 4 in 2017.

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	-
Total Mark Rate	-	-	7.80%	-

Table 2 - 2012 McLoughlin Creek brood year releases.

	Marked	Unmarked	Totals	Mark rate
Seapen Release	160,000	1,707,284	1,867,284	8.57%
Hatchery Release	-	146,657	146,657	0.00%
Total Release	160,000	1,853,941	2,013,941	-
Total Mark Rate	-	-	7.94%	-

Table 3 - 2013 McLoughlin Creek brood year releases.

	Marked	Unmarked	Totals	Mark rate
Seapen Release	161,721	1,632,860	1,794,581	9.01%
Hatchery Release	-	168,786	168,786	0.00%
Total Release	161,721	1,801,646	1,963,367	-
Total Mark Rate	-	-	8.24%	-

Adult Assessment - 2015 Area 7 Fishery

2015 was the second year with expected returns of marked chum; these being from the 2011 and 2012 brood year releases by McLoughlin Hatchery. JO Thomas was contracted to provide sampling of commercial seine and gillnet fisheries in Area 7 that were likely to intercept McLoughlin chum. A total of 248,919 chum were recorded as catch in the fishery which spanned statistical weeks 075 through 093 (Table 4). Of the total catch, 55,325 chum were sampled for marks and 608 were found to be marked (Table 5). A total of 763 fish were sampled and processed for age (Tables 6-8).

Table 4 - 2015 Area 7 commercial chum fishery total catch and sample rate.

Statistical Week	Area	Gear	Catch	Sample Size	Sample Rate
075	7	Seine	162	-	0.00%
		Gill Net	-	-	0.00%
		Total	162	-	0.00%
081	7	Seine	2,800	-	0.00%
		Gill Net	682	-	0.00%
		Total	3,482	-	0.00%
082	8 (Area 7 fishery)	Seine	20,153	1,149	5.70%
		Gill Net	1,920	-	0.00%
		Total	22,073	-	0.00%
083	7	Seine	83,437	14,652	17.56%
		Gill Net	16,460	1,854	11.26%
		Total	99,897	17,655	17.67%
091	7	Seine	95,764	25,589	26.72%
		Gill Net	53,258	12,081	22.68%
		Total	149,022	37,670	25.28%
092	7	Seine	10,540	-	0.00%
		Gill Net	15,233	-	0.00%
		Total	25,773	-	0.00%
093	7	Seine	6,899	-	0.00%
		Gill Net	3,239	-	0.00%
		Total	10,138	-	0.00%
075 - 093	7	Seine	179,201	41,390	23.10%
		Gill Net	69,718	13,935	19.99%
		Total	248,919	55,325	22.23%

Table 5 – 2015 Area 7 commercial chum fishery mark rate.

Sub-Sample Size	Criteria	Marked Male	Marked Female	Marked Unknown	Total Marked
55,325	Number of Marked	268	321	19	608
	Mark rate	0.48%	0.58%	0.03%	1.10%

Table 6 - 2015 Area 7 commercial chum fishery age composition.

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	51	2010	12	1.57%
	41	2011	695	91.09%
	31	2012	56	7.34%
Total			763	100%

Table 7 - 2015 Area 7 commercial chum fishery age compositions of Marked Fish.

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	31	2012	26	5.27%
	41	2011	464	94.12%
	51	2010	3	0.61%
Total			493	100%

Table 8 - 2015 Area 7 commercial chum fishery age compositions of Unmarked Fish.

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	31	2012	30	11.11%
	41	2011	231	85.56%
	51	2010	9	3.33%
Total			270	100%

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

Adult Assessment - 2015 Escapement

Adult assessment in fresh water consisted of examining fish taken for broodstock (egg-takes) and in a carcass pitch (called a dead-pitch) for incidence of marks, enumeration of adult chum in the river and collection of scales samples to obtain age composition in the escapement (Tables 9 & 10). A total of 130 usable scale samples were collected with a mix of male, female, marked and unmarked (Tables 11-13).

Table 9 – 2015 McLoughlin Creek chum escapement mark samples.

Source	Males Unmarked	Males Marked	Females Unmarked	Females Marked	Unknown Sex & Mark	Grand Total
Broodstock	959	78	1019	89	0	2145
Deadpitch	1441	113	1032	114	288	2988
TOTAL	2400	191	2051	203	288	5133

Table 10 - 2015 McLoughlin Creek chum escapement mark rate.

Source	Male Mark Rate	Female Mark Rate	Total Mark Rate
Broodstock	7.52%	8.03%	7.79%
Deadpitch	7.27%	9.95%	8.41%
Total	7.37%	9.01%	8.13%

Table 11 – 2015 McLoughlin Creek chum river return **total** age composition (marked and unmarked combined).

Species	Gilbert-Rich	Brood Yr.	Frequency	Percent
Chum	51	2010	4	3.1%
	41	2011	118	90.8%
	31	2012	8	6.2%
Total			130	100%

Table 12 – 2015 McLoughlin Creek chum river return **unmarked** age composition.

Species	Gilbert-Rich	Brood	Frequency	Percentage
Chum	31	2012	8	15%
	41	2011	42	78%
	51	2010	4	7%
Total			54	100%

Table 13 – 2015 McLoughlin Creek chum river return **marked** age composition.

Species	Gilbert-Rich	Brood	Frequency	Percentage
Chum	31	2012	0	0%
	41	2011	76	100%
	51	2010	0	0%
Total			76	100%

Table 14 – Summary of contribution to the 2015 Area 7 commercial fishery from McLoughlin Creek chum enhancement of brood years 2011 and 2012.

2011 BROOD YEAR	
2011 total Release	2,073,142
2011 Marked	161,622
2011 Mark rate	7.80%

2012 BROOD YEAR	
2012 total Release	2,013,941
2012 Marked	160,000
2012 Mark rate	7.94%

2015 AREA 7 FISHERY	
2015 Catch	248,919
2015 Catch Mark Samples	55,325
2015 Catch Mark Rate	1.10%
2015 Catch @ age 4 percentage	91.09%
2015 Catch @ age 4 estimate	226,740
2015 Catch @ age 4 marked	2,494
2015 Catch @ age 4 mark rate	1.00%
2015 Catch @ age 3 percentage	7.34%
2015 Catch @ age 3 estimate	18,271
2015 Catch @ age 3 marked	201
2015 Catch @ age 3 mark rate	0.08%

2011 ENHANCED CONTRIBUTION TO 2015 FISHERY	
2015 Catch @ age 4 marked	2,494
2015 Catch @ age 4 enhanced	31,993
2015 Catch - enhanced contribution by 2011 brood	12.85%

2012 ENHANCED CONTRIBUTION TO 2015 FISHERY	
2015 Catch @ age 3 marked	201
2015 Catch @ age 3 enhanced	2,530
2015 Catch - enhanced contribution by 2012 brood	1.02%

TOTAL ENHANCED CONTRIBUTION TO 2015 FISHERY	
2015 Catch - estimated marks	2,695
2015 Catch - estimated enhanced	34,522
2015 Catch - enhanced contribution	13.87%

Table 15 – Summary of contribution to the 2015 McLoughlin Creek chum escapement by enhancement of brood years 2011 and 2012.

2011 BROOD YEAR	
2011 total Release	2,073,142
2011 Marked	161,622
2011 Mark rate	7.80%

2012 BROOD YEAR	
2012 total Release	2,013,941
2012 Marked	160,000
2012 Mark rate	7.94%

2015 ESCAPEMENT	
2015 Escapement Estimate	6,560
2015 Escapement Mark Samples	4,845
2015 Escapement Mark Rate	8.13%
2015 Escapement @ age 4 composition	90.8%
2015 Escapement @ age 4 estimate	5,955
2015 Escapement @ age 4 marks	484
2015 Escapement @ age 4 mark rate	7.38%
2015 Escapement @ age 3 percentage	6.2%
2015 Escapement @ age 3 estimate	403
2015 Escapement @ age 3 marks	33
2015 Escapement @ age 3 mark rate	0.50%

2011 ENHANCED CONTRIBUTION TO 2015 ESCAPEMENT	
2015 Escapement @ age 4 marked	484
2015 Escapement @ age 4 enhanced	6,210
2015 Escapement - enhanced contribution by 2011 brood	94.66%

2012 ENHANCED CONTRIBUTION TO 2015 ESCAPEMENT	
2015 Escapement @ age 3 marked	33
2015 Escapement @ age 3 enhanced	413
2015 Escapement - enhanced contribution by 2012 brood	6.29%

TOTAL ENHANCED CONTRIBUTION TO 2015 ESCAPEMENT	
2015 Escapement - estimated marks	517
2015 Escapement - estimated enhanced escapement	6,622
2015 Escapement - enhanced contribution	100%

Discussion

This is the second year that adult chum from the adipose fin-clipped (AFC) marked brood years (2011 and 2012) returned to McLoughlin Creek. On average, this population is comprised predominantly of 4 year old adults (70-90% in 2013-2015). Complete estimates of brood year-specific survival rate and enhanced contribution to catch and escapement will not be available until all cohorts have recruited to the fishery and escapement, which will be 2016 for the 2011 brood year and 2018 for the 2013 brood year.

Analysis of the 2015 return year data provides an estimate of the contribution of the enhanced 2011 and 2012 brood years to the commercial fishery as well as escapement. As age 3 recruits comprise only a small proportion of the total recruitment from McLoughlin Creek hatchery, the estimated contribution of 1.02% of the total Area 7 commercial catch from brood year 2012 (3 year olds) compared to the 12.85% from brood year 2011 (4 year olds) is not unexpected. These two brood years combined provided an estimated 13.87% of the Area 7 commercial catch.

In 2014, a higher rate of enhanced contribution to the terminal escapement was observed, compared to the fishery. This seemed logical as the fishery was likely comprised of mixed stocks, thus lowering the frequency of McLoughlin chum. This was again observed in 2015 for both brood years. The sampling shows enhanced contribution to the 2015 escapement to be 100%. Data collected in 2016 will help provide further clarity on the accuracy of this.

The marked adults returning as 3 years olds in 2014 (2011 brood) were observed in both the fishery and escapement. In 2015, there were marked adults returning from both the 2011 brood (4 years olds) and 2012 brood (3 years olds). The 2011 brood were released into McLoughlin Creek while the 2012 brood were held in a sea-pen prior to release. It is interesting and not completely unexpected that no 3 years olds (sea-pen release) were detected in the escapement. The 2013 brood were also release from a sea-pen. It will be interesting to observe if any adults returning in 2016 are 3 or 4 years olds (sea-pen releases) are detected in the creek escapement.

The 2014 adult data allowed us to detect an issue which still needs to be highlighted in 2015. 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 but to a much lesser degree with 3.1% of marked fishery catch being aged at 5 years. This issue will not be visible in future years as multiple age cohorts which are marked will be returning to the system and masking this "ageing error". Discussion will continue on ways to address this issue.

APPENDIX I
Financial Expenditures Summary

The total PSC funding for this project was \$17,700. \$16,500 that was provided to DFO is reported below. With agreement of DFO, the remaining \$1,200 was not provided to DFO and remains with the PSC.

Pacific Salmon Commission

McLoughlin Creek Enhanced Chum Salmon Assessment 2015-2016 Expenditures (PC 57352)

Funds received from PSC	
H02908C08-406	\$ (16,500.00)
Scientific Consultant	
F1008-5-15	
JO Thomas - Area 7 Fishery Sampling	\$ 15,675.00
JO Thomas - GST	\$ 825.00
Balance	\$ -