

## Canadian Salmon Catch and Enhanced Salmon Production in 2015 and 2016

by

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Submitted to the

**NORTH PACIFIC ANADROMOUS FISH COMMISSION**

by

Canada

April 2017

**THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:**

Tompkins, A., P. Hall, J. Bateman, and S. Hamilton. 2017. Canadian salmon catch and enhanced salmon production in 2015 and 2016. NPAFC Doc.1714. 8 pp. Fisheries and Oceans Canada (Available at <http://www.npafc.org>).

**Keywords:** Salmon, steelhead, catch, enhancement, British Columbia

## **ABSTRACT**

This document reports final catch estimates for 2015, preliminary catch estimates for 2016 for the six major salmon species in British Columbia (B.C.) and Yukon fisheries. Catch is reported for commercial fisheries (numbers and total weight) in tidal waters and recreational (numbers only) and aboriginal fisheries (numbers only) in tidal and non-tidal waters. Catches include non-Canadian origin fish caught in B.C. and exclude Canadian origin fish caught in fisheries outside B.C. This document also summarizes release information for salmon including steelhead trout from Fisheries and Oceans Canada (DFO) and Freshwater Fisheries Society of BC enhancement facilities in BC in 2015 and 2016.

## **INTRODUCTION**

The six species of salmon native to BC contribute to commercial, recreational, and aboriginal fisheries. Commercial net fisheries tend to focus on sockeye (*Oncorhynchus nerka*), chum (*O. keta*), and pink (*O. gorbuscha*) salmon, while recreational harvesters catch mostly Chinook (*O. tshawytscha*), coho (*O. kisutch*), and steelhead (*O. mykiss*). All species of salmon are valued by aboriginal fisheries, which typically occur in terminal areas within freshwater but harvest also occurs in marine waters. Steelhead trout constitute a relatively minor component of the catch.

This document reports 2015 final catch estimates and preliminary 2016 catch estimates of salmon in BC and Yukon fisheries. Estimates are reported for retained commercial catch (numbers and total weight) in tidal waters (except the Yukon fisheries) and recreational (numbers only) and aboriginal catch (numbers only) in tidal and non-tidal waters by species. Catches include non-Canadian origin fish caught in B.C. and exclude Canadian origin fish caught outside B.C.

The objectives of the DFO Salmonid Enhancement Program (SEP) are to rebuild stocks and increase catch through the expanded use of enhancement technology. The program produces chinook, coho, chum, pink, and sockeye salmon, as well as small numbers of steelhead and cutthroat trout (*O. clarki*). Steelhead and cutthroat enhancement takes place at SEP facilities under a cooperative arrangement with the Government of B.C. Projects include hatcheries, fishways, spawning and rearing channels, and small classroom incubators, releases ranging in size from nearly 100 million juveniles annually from spawning channels, to less than one hundred from school classroom projects.

## **CATCH ESTIMATES**

A brief description of the data and sources of information for the 4 major fishery types follows:

### *Commercial Catch Estimates*

The Fisheries Operating System (FOS) is the official salmon commercial fishery catch database for Fisheries and Oceans Canada (DFO) Pacific Region. FOS maintains various fisher-produced data

(e.g. sale slips, logbooks, at-sea interviews) and fisher-independent data (e.g. on-board observers and dockside monitors). The final commercial catch estimates reported here for 2015 and 2016 are manager determined estimates based on resolution of all data sources.

Commercial catch estimates for 2015 and 2016 are presented as numbers and weights (Table 1) of fish retained by commercial salmon vessels (salmon gill net, salmon seine net and salmon troll). Weights are based on sale slip data and are given as round (i.e., whole fish) equivalents. Sale slips record gear type, area of catch, date of landing, and landed weight and value by species. Since the value of the landing and resulting payments are based primarily on the landed weight, weight estimates are considered reasonably accurate (Sandher et al. 2012).

Piece estimates recorded on sale slips are usually estimated by applying an estimated average weight to the landed weight, particularly for high volume net landings (i.e., net landings of sockeye, pink and/or chum salmon). The average weight estimates are obtained by weighing counted samples of landed catch during offloading. Sampling for average weights is conducted to allow relatively accurate and precise, species-, area-, time- and gear-specific estimates of average weights to be generated. Such estimates have been widely available for Chinook and coho salmon since the early 1980s and for sockeye, chum and pink salmon since 1994.

#### *Recreational Catch Estimates (non-Steelhead)*

Recreational salmon catches for 2015 and 2016 are reported in pieces (Table 2). Creel surveys are the primary source of recreational catch data, resulting in estimates by DFO Pacific Fishery Management Area (PFMA) and month. Creel surveys generally cover the times and areas with relatively large effort and catch, but typically not times and areas where fishing is open with relatively low effort and/or catch rates. Catch from sport fishing lodges are based on logbook programs where they are in use. Catch from lodges not reporting via logbooks is incorporated in creel survey based estimates. Further, the numbers provided here are the unexpanded estimates from the creel and logbook programs; they do not include estimates for catch from times and areas not surveyed. Consequently, recreational catches reported here underestimate total catch.

#### *Recreational Steelhead Catches – a Historical Overview*

Although there are no targeted fisheries on steelhead in marine waters, valuable freshwater recreational fisheries occur that are a provincial responsibility delegated from the Government of Canada. These fisheries are managed to provide opportunities to go fishing with the expectation of catching a fish (BC Ministry of Forests, Lands and Natural Resource Operations, 2014).

There has been no retention of wild steelhead in BC sport fisheries since 1 April 2007 - recreational fisheries that currently operate on non-enhanced rivers are strictly catch and release. Recreational fisheries also occur in ~13 hatchery-augmented rivers, where an angler is allowed to harvest one fish per day (maximum 10 per season). Total catches are estimated via the Steelhead Harvest Analysis – a

questionnaire mailed to 50% of all BC and 100% of non-BC residents who purchased a steelhead licence. Estimates are not yet available for post 2013.

### *Aboriginal Catch Estimates*

Aboriginal (subsistence) catch represents retained catch, and is reported in pieces (Table 3). Aboriginal catch statistics can usually be resolved to PFMA and year, but areas may be grouped in some cases. A variety of approaches have been used to generate estimates. While aboriginal catch estimation programs cover many of the largest aboriginal fisheries, coverage is incomplete both temporally and spatially. Similar to recreational catch, aboriginal catch estimates presented here do not include catch from times and areas not covered by catch estimation programs, and therefore underestimate total catch.

## **ENHANCED PRODUCTION**

Annual egg and juvenile stock production targets for hatcheries are set pre-season, in consultation with project managers, stock assessment biologists and harvest management biologists. Production objectives include conservation or rebuilding, harvest and/or assessment. Other considerations include potential species and stock interactions, effects on natural stocks, harvest concerns, habitat capacity and project capacity. The production plan is finalized after review by industry, the public and other interested groups in the Salmon Integrated Fisheries Management Planning process.

Depending on the species and enhancement approach, juvenile fish are released at various life stages. Chum and pink salmon are released either immediately after emergence as unfed fry or after one month of feeding (fed fry). Coho are released as fry, either at emergence or after 3 to 5 months of rearing, or as smolts after one year of rearing. In B.C. sockeye enhancement is typically conducted using spawning and rearing channels rather than hatcheries, and juveniles emigrate volitionally soon after emergence. Sockeye are also enhanced through lake fertilization programs, and most migrate to sea after one year of lake rearing. Coastal ocean-type chinook stocks are released after three to four months of rearing. Interior stream-type stocks are frequently reared for one year, and generally constitute a very small component of the total numbers of chinook released. Releases from hatcheries are usually estimated by subtracting known egg and fry mortalities from egg numbers. Releases from rearing channels are estimated by sampling out-migrants.

Release information for salmon from DFO enhancement facilities and the Fraser Valley Trout Hatchery (Freshwater Fisheries Society) in B.C. in 2015 (final) and 2016 (preliminary) is summarized in Table 4. Approximately 296.1 and 281.7 million salmon were released, in 2015 and 2016 respectively. In both years sockeye and chum releases account for almost 80% of the enhanced production. Of these 13 hatcheries augmenting steelhead production, one is a fry release program (~10,000 fry/year) and 12 are smolt release programs (300,000-400,000 total smolts annually, Table 4) (Mark Beere, BC Ministry of Forests, Lands and Natural Resource Operations, Smithers; 18 Jan 2016, Pers. Comm.).

It is not possible to assess each enhancement project and release strategy. Consequently, certain stocks are used as indicators, their production is tagged or marked annually and rigorous fishery and escapement sampling and estimation programs are conducted. Survival and exploitation estimates are used for time series analyses of both wild and enhanced populations. Enhanced contributions and survivals of chinook, coho, and chum salmon are normally estimated by applying a tag and /or external mark to a portion of the fish released and subsequently recovering these marked fish in fisheries and the escapement. Marking occurs prior to release, and recovery takes place through sampling programs in the fisheries and on the spawning grounds and enhancement sites. Marks are chiefly the removal of the adipose fin, with some chinook and coho stocks also receiving a coded wire tag to enable identification of stock and release year. Beginning in 1996, most enhanced coho from southern BC have been marked with a fin clip to enable the prosecution of mark-selective fisheries. Some species and stocks are given a thermal otolith mark to estimate enhanced contributions to terminal areas. Thermal marking is coordinated with the DFO Salmon Assessment Section.

## **ACKNOWLEDGEMENTS**

Thanks to Mark Beere, BC Ministry of Forests, Lands and Natural Resource Operations for information on steelhead and Jim Irvine, DFO for assistance determining weight statistics.

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Table 1. Canadian commercial catch estimates of non-steelhead Pacific salmon for 2015 and 2016 presented in numbers (000's) and weights (MT).

Reporting Area	Year	Commercial Catch Number (000's)						Commercial Catch Round Wt (MT)					
		Pink	Chum	Sockeye	Coho	Chinook	Total	Pink	Chum	Sockeye	Coho	Chinook	Total
Taku / Stikine	2015	-	2.90	73.47	13.54	4.03	93.94	-	-	207.19	49.75	26.59	283.52
	2016	-	2.70	113.37	14.81	2.62	133.51	-	-	262.20	58.00	29.60	349.80
Haida Gwaii	2015	40.89	59.14	2.49	168.78	106.71	378.01	76.20	286.77	6.95	568.61	668.32	1,606.86
	2016	33.69	0.02	0.55	159.89	149.45	343.60	69.94	0.08	1.39	522.10	801.49	1,394.99
North Coast	2015	362.04	276.87	223.49	107.41	3.22	973.02	658.15	1,243.69	532.84	337.33	21.35	2,793.36
	2016	1,599.18	97.41	156.46	95.93	1.69	1,950.66	3,103.99	453.65	383.43	349.92	12.08	4,303.07
Central Coast	2015	748.09	874.82	1.83	0.96	5.33	1,631.04	1,488.79	4,122.40	5.33	3.83	32.97	5,653.31
	2016	125.48	475.27	76.92	1.79	3.19	682.65	267.15	2,217.94	237.92	7.27	19.94	2,750.22
South Coast	2015	183.97	772.39	31.86	0.82	0.07	989.11	275.40	3,182.42	74.59	2.60	0.40	3,535.41
	2016	0.88	2,074.47	6.56	0.44	0.03	2,082.38	1.80	8,797.68	16.45	1.53	0.17	8817.63
West Coast Vancouver Island	2015	0.20	171.59	876.65	6.52	64.39	1,119.36	0.38	671.72	1,741.57	17.21	240.26	2,671.15
	2016	0.01	420.47	400.32	1.15	54.40	876.35	0.00	1,723.40	932.26	5.32	368.34	3,029.31
Fraser River	2015	102.28	137.59	5.55	0.19	4.52	250.12	172.92	542.46	13.91	0.60	31.07	760.96
	2016		191.67	3.72	0.52	2.32	198.22	0.00	818.67	9.32	1.80	14.60	844.39
Whole Country	2015	1,437.47	2,295.30	1,215.34	298.21	188.27	5,434.59	2,671.84	10,049.47	2,582.37	979.93	1,020.95	17,304.56
	2016	1,759.23	3,262.00	757.90	274.54	213.71	6,267.36	3,442.88	14,011.41	1,842.97	945.96	1,246.19	21,489.42

Table 2. Canadian recreational catch estimates of non-steelhead Pacific salmon for 2015 and 2016 presented in numbers (000's).

<b>Reporting Area</b>	<b>Year</b>	<b>Recreational Catch Numbers (000's)</b>					<b>Total</b>
		<b>Pink</b>	<b>Chum</b>	<b>Sockeye</b>	<b>Coho</b>	<b>Chinook</b>	
South Coast	<b>2015</b>	126.68	7.19	0.38	43.16	148.11	325.52
	<b>2016</b>	5.04	5.70	4.67	34.44	86.38	136.22
West Coast Vancouver Island	<b>2015</b>	3.60	0.06	93.35	27.64	83.08	207.73
	<b>2016</b>	0.20	0.20	53.00	21.16	65.25	139.81
North Coast	<b>2015</b>	3.58	0.63	0.10	54.41	23.30	82.01
	<b>2016</b>	4.29	2.51	0.06	50.30	16.17	73.32
Haida Gwaii	<b>2015</b>	0.66	0.48	0.10	32.70	52.20	86.14
	<b>2016</b>	1.90	1.55	0.05	30.85	42.80	77.15
Whole country	<b>2015</b>	134.52	8.36	93.93	157.91	306.68	701.41
	<b>2016</b>	11.43	9.96	57.77	136.74	210.60	426.50

Table 3. Canadian subsistence catch estimates of Pacific salmon for 2015 and 2016 presented in numbers (000's).

Reporting Area	Year	Subsistence Numbers (000's)						Total
		Pink	Chum	Sockeye	Coho	Chinook	Steelhead	
South Coast	2015	41.38	61.06	184.72	0.93	23.98	-	312.07
	2016	2.46	92.37	174.60	5.06	11.23	-	285.72
West Coast Vancouver Island	2015	0.00	2.25	39.39	1.92	5.97	-	49.53
	2016	0.03	2.90	37.35	6.70	5.87	-	52.85
North Coast	2015	32.40	4.47	301.74	12.64	19.66	-	370.90
	2016	9.10	1.31	208.72	8.99	11.02	2.04	241.18
Haida Gwaii	2015	0.21	-	11.89	1.40	3.33	-	16.83
	2016	-	-	7.34	-	-	-	7.34
Yukon and Northern BC	2015	-	1.60	9.91	0.30	2.43	-	14.24
	2016	-	4.00	11.65	0.05	3.61	-	19.30
Whole Country	2015	73.99	69.38	547.64	17.19	55.37	-	763.57
	2016	11.58	100.58	439.67	20.80	31.72	2.04	606.39



Table 4. DFO Salmon Enhancement Program and Fraser Valley Hatchery enhanced salmon releases in 2015 and 2016 presented in numbers (000's).

Reporting Area	Release Year	Enhanced Salmon Releases (000's)						Total
		Pink	Chum	Sockeye	Coho	Chinook	Steelhead	
BC Interior	2015	-	-	27,321.73	253.88	1,194.86	-	28,770.46
	2016	-	-	10,453.10	155.39	1,190.36	-	11,798.85
Fraser River	2015	-	10,783.27	19,688.85	2,396.11	2,201.82	175.10	35,245.15
	2016	1,516.40	10,610.60	3,773.31	1,804.58	2,140.10	173.25	20,018.24
South Coast	2015	8,410.99	16,630.00	653.80	4,811.08	13,923.48	45.16	44,474.51
	2016	9,421.90	37,966.60	329.08	4,018.85	14,287.84	86.66	66,110.93
West Coast Vancouver Island	2015	-	21,859.76	-	786.14	13,901.04	48.65	36,595.59
	2016	-	21,218.75	-	795.17	15,326.94	100.28	37,441.13
Central Coast	2015	-	9,120.37	178.83	77.00	2,603.57	-	11,979.77
	2016	-	8,365.62	171.40	71.39	2,679.67	-	11,288.07
North Coast	2015	-	1,634.75	134,650.64	845.14	1,603.53	-	138,734.05
	2016	-	1,631.14	130,426.69	893.63	1,634.99	-	134,586.45
Haida Gwaii	2015	-	37.18	-	147.11	113.11	-	297.40
	2016	-	144.92	-	211.77	116.78	-	473.46
Whole Country	2015	8,410.99	60,065.33	182,493.84	9,316.45	35,541.40	268.91	296,096.93
	2016	10,938.30	79,937.62	145,153.57	7,950.77	37,376.68	360.19	281,717.14