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Canadian Salmon Catch and Enhanced Salmon Production in 2014 and 2015 with a Historical Overview of Recreational Steelhead Catches

by

Arlene Tompkins[1], Shelee Hamilton[1], Joan Bateman[2], and James R. Irvine[1]

[1]Fisheries and Oceans Canada
3190 Hammond Bay Road
Nanaimo, British Columbia, Canada
V9T 6N7

[2]Fisheries and Oceans Canada
200 - 401 Burrard Street
Vancouver, British Columbia, Canada
V6C 3S4

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ABSTRACT

This document reports final catch estimates for 2014, and preliminary catch estimates for 2015 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. A historical overview of recreational freshwater catches for steelhead (1967-2013) is also provided. 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 2014 and 2015.

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. Steelhead constitute a relatively minor component of the catch.

This document reports final catch estimates for 2014 and preliminary catch estimates for 2015 of salmon in BC and Yukon fisheries. Estimates are reported for retained commercial catch (numbers and total weight) in tidal waters 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 2014 and 2015 are manager determined estimates based on resolution of all data sources.

Commercial catch estimates for 2014 and 2015 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 2014 and 2015 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). Of these 13 hatchery-augmented streams, one is a fry release program (~10,000 fry/year) and 12 are smolt release programs (~400,000 total smolts annually, Table 3) (Mark Beere, BC Ministry of Forests, Lands and Natural Resource Operations, Smithers; 18 Jan 2016, Pers. Comm.).

Total catches are estimated via the Steelhead Harvest Analysis – estimates are not yet available for post 2013. The harvest analysis is a questionnaire mailed to 50% of all BC and 100% of non-BC residents who purchased a steelhead licence. With an estimated ~50% return rate from the 75% that angled for steelhead, the results represent the catches of ~25% of anglers that fished for steelhead in BC. Catches peaked in the late 1980's with a maximum catch exceeding 180,000 steelhead, the vast majority of which were released (Figure 1; Mark Beere, BC Ministry of Forests, Lands and Natural Resource Operations, Smithers; 18 Jan 2016, Pers. Comm.).

Aboriginal Catch Estimates

Aboriginal (subsistence) catch represents retained catch, and is reported in pieces (Table 4). 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 2014 (final) and 2015 (preliminary) is summarized in Table 4. Approximately 240.3 and 294.7 million salmon were released, in 2014 and 2015 respectively. In both years sockeye and chum releases account for greater than 70% of the enhanced production.

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.

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REFERENCES CITED

Ministry of Forests, Lands and Natural Resource Operations. 2014. Provincial Framework for Steelhead Management in British Columbia. Fish, Wildlife and Habitat Management Branch, Victoria, B.C. DRAFT Report, July 2014. http://www.bcfdf.com/bcfdf_news/Framework.pdf

Sandher, J., C. Lynch, D. Willis, R. Cook and J. R. Irvine. 2012. Canadian enhanced salmonid production during 1977-2011 (1976-2010 brood years). NPAFC Doc. 1420. 10 pp. Fisheries and Oceans Canada. (Available at http//www.npafc.org).

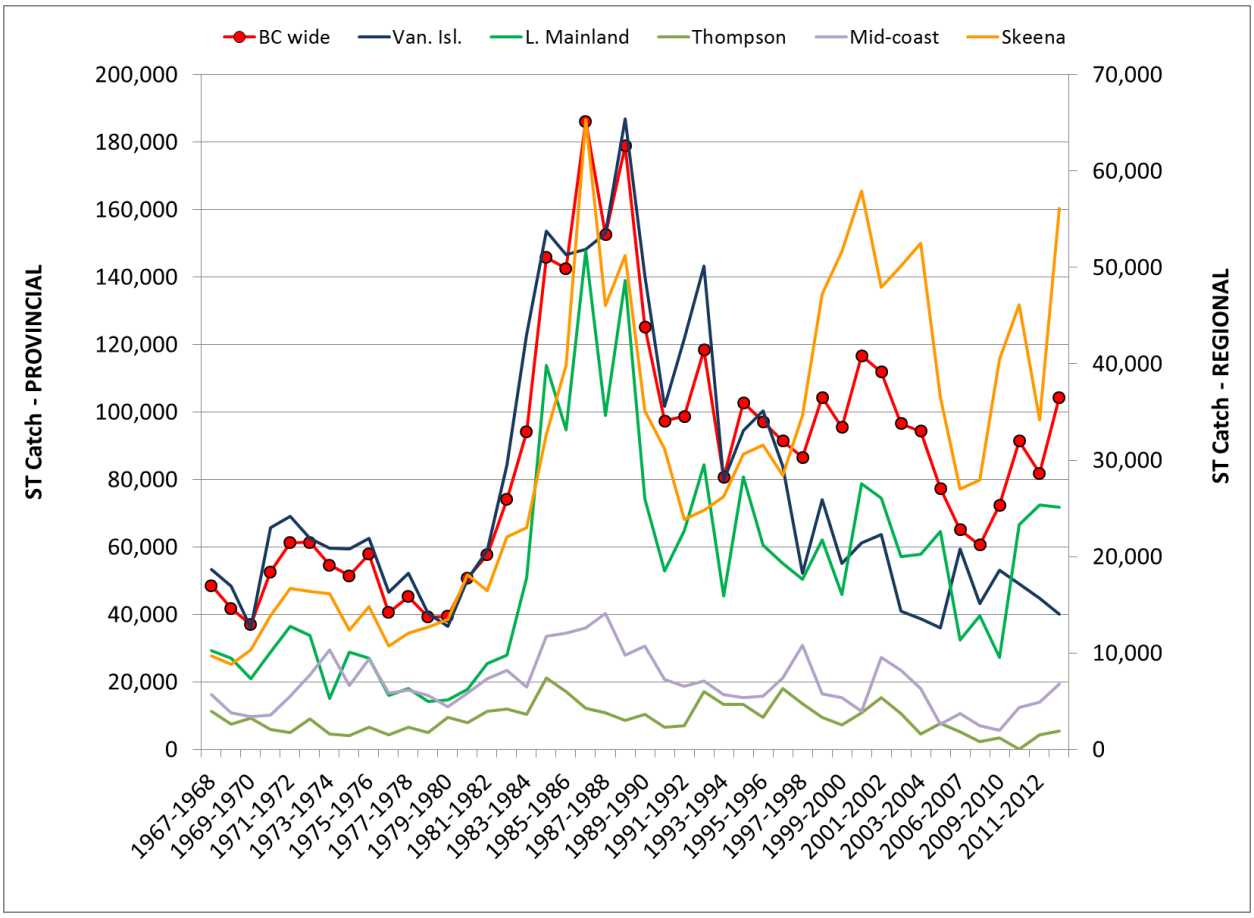

Figure 1. Historical overview of recreational catches (mostly non-retention) for steelhead in recreational freshwater fisheries. (BC – British Columbia, Van. Isl. – Vancouver Island, L. Mainland – Lower Mainland, BC).

Table 1. Canadian commercial catch estimates of non-steelhead Pacific salmon for 2014 and 2015 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	2014	-	-	51.35	20.22	3.30	74.87	-	-	144.81	74.29	21.77	240.86
	2015	-	-	73.47	13.54	4.03	91.04	-	-	207.19	49.75	26.59	283.52
Haida Gwaii	2014	638.83	0.12	41.300.	139.32	172.22	991.798	983.80	0.55	108.61	381.73	1,085.00	2,559.69
	2015	40.89	59.14	2.49	168.78	106.71	378.01	63.32	287.14	6.97	405.23	679.55	1,442.20
North Coast	2014	2,971.81	233.17	658.41	76.97	3.20	3,943.56	4,606.31	1,172.84	1,692.10	217.83	21.40	7,710.48
	2015	402.52	671.78	223.50	108.37	3.22	1,409.39	626.29	3,268.90	633.59	304.56	22.98	4,856.32
Central Coast	2014	41.62	27.73	2.53	0.07	2.23	74.18	70.75	154.20	6.76	0.20	16.02	247.93
	2015	707.60	479.91	1.81	0.00	5.33	1,194.66	1,096.97	2,418.10	4.81	0.00	31.45	3,551.33
South Coast	2014	586.70	377.86	5,063.95	1.99	0.43	6030.93	932.85	1,889.32	13,318.19	5.67	2.71	16,148.74
	2015	183.97	772.20	31.86	0.82	0.07	988.92	291.55	3,420.85	69.65	2.63	0.38	3,785.06
West Coast Vancouver Island	2014	0.11	1.18	424.95	35.56	126.74	588.53	0.18	5.03	1126.11	100.27	769.31	2,000.90
	2015	0.20	171.59	876.65	6.52	64.39	1,119.36	0.37	724.32	1,751.58	21.15	361.39	2,858.81
Fraser River	2014	0.09	76.75	3,045.91	0.24	9.79	3,132.78	0.12	408.30	8315.34	0.56	64.83	8,789.15
	2015	102.28	137.86	5.55	0.19	4.52	250.40	168.92	554.26	12.30	0.61	31.49	767.58
Whole Country	2014	4,239.16	716.81	9,288.40	274.37	317.91	14,836.65	6,594.01	3,630.24	24,711.92	780.55	1,981.04	37,697.76
	2015	1,437.47	2,292.48	1,215.33	298.21	188.27	5,431.76	2,247.42	10,673.56	2,686.08	783.93	1,153.83	17,544.81

Table 2. Canadian recreational catch estimates of non-steelhead Pacific salmon for 2014 and 2015 presented in numbers (000's).

		Recreational Catch Numbers (000's)					
Reporting Area	Year	Pink	Chum	Sockeye	Coho	Chinook	Total
South Coast	2014	23.50	3.96	359.63	59.12	89.75	535.96
	2015	111.41	4.55	0.35	36.16	128.77	281.24
West Coast Vancouver Island	2014	0.52	0.08	24.06	45.47	84.34	154.47
	2015	3.60	0.06	93.35	27.64	83.08	207.73
North Coast	2014	3.92	0.18	24.30	54.21	20.79	103.40
	2015	3.64	0.63	0.10	55.43	23.30	83.09
Haida Gwaii	2014	0.64	0.27	0.30	31.24	44.90	77.35
	2015	0.66	0.48	0.10	32.70	52.20	86.14
Whole country	2014	28.58	4.49	408.29	190.04	239.78	871.18
	2015	119.31	5.72	93.89	151.93	287.35	658.21

Table 3. DFO Salmon Enhancement Program and Fraser Valley Hatchery enhanced salmon releases in 2014 and 2015 presented in numbers (000's).

Reporting Area	Release Year	Enhanced Salmon Releases (000's)						
		Pink	Chum	Sockeye	Coho	Chinook	Steelhead	Total
BC Interior	2014	-	-	11,200	261.843	1,068.028	-	12,529.87
	2015	-	-	27,321.73	221.015	1,190.624	-	28,733.37
Lower Fraser River	2014	8,341.00	12,008.44	37,684.77	2,441.15	2,202.57	240.18	62,876.02
	2015	-	10,783.27	19,688.85	2,396.11	2,201.37	175.1	35,199.49
South Coast	2014	14,252.27	40,953.81	320.42	5,839.06	12,327.41	97.99	73,790.95
	2015	8,059.54	15,733.77	653.80	4,261.72	13,923.48	28.98	42,661.29
West Coast Vancouver Island	2014	-	14,233.97	-	1,108.81	16,015.97	-	31,358.74
	2015	-	21,863.59	-	1,323.82	13,901.04	48.65	37,137.09
Central Coast	2014	33.50	9,658.29	248.94	104.11	2,454.07	-	12,498.90
	2015	-	9,120.37	178.83	77.00	2,603.57	-	11,979.77
North Coast	2014	-	1,710.27	42,652.61	900.24	1,743.47	49.76	47,056.35
	2015	-	1,634.75	134,650.64	834.58	1,584.79	-	138,704.76
Haida Gwaii	2014	-	-	-	82.11	134.82	-	216.93
	2015	-	37.18	-	147.11	113.11	-	297.40
Whole Country	2014	22,626.77	78,564.77	92,106.74	10,737.32	35,946.34	345.83	240,327.77
	2015	8,059.54	59,172.93	182,493.84	9,261.35	35,517.97	207.54	294,713.16

Table 4. Canadian subsistence catch estimates of Pacific salmon for 2014 and 2015 presented in numbers (000's).

		Subsistence Numbers (000's)						
Reporting Area	Year	Pink	Chum	Sockeye	Coho	Chinook	Steelhead	Total
South Coast	2014	17.84	39.73	872.87	6.34	23.68	0.00	650.79
	2015	41.38	61.06	184.72	0.93	23.98	0.00	312.07
West Coast Vancouver Island	2014	1.85	1.15	65.76	6.59	5.58	0.07	81.00
	2015	0.00	2.25	39.39	1.92	5.97	0.00	49.53
North Coast	2014	9.94	4.84	193.72	14.31	11.75	0.00	234.57
	2015	32.40	4.47	301.74	12.64	19.66	0.00	370.90
Haida Gwaii	2014	0.90	0.17	14.45	1.47	2.25	0.00	19.24
	2015	0.21	0.00	11.89	1.40	3.33	0.00	16.83
Yukon and Northern BC	2014	0.00	2.53	13.29	0.10	1.24	0.00	17.16
	2015	0.00	1.00	9.91	0.30	2.43	0.00	13.64
Whole Country	2014	30.53	48.42	1,160.09	28.81	44.50	0.07	1,312.43
	2015	73.986	68.776	547.642	17.192	55.374	0.00	762.97