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Canadian Salmon Catch and Enhanced Salmon Production in 2017–2019

by

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ABSTRACT

This document reports final catch estimates for 2017–2018 and preliminary catch estimates for 2019 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 B.C. enhancement facilities in B.C.

INTRODUCTION

The six species of salmon native to B.C. 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 final catch estimates for 2017–2018 and preliminary 2019 catch estimates of Pacific salmon in B.C. 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.

This document also reports hatchery and other enhancement-related releases. 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 range in size from nearly 100 million juveniles from spawning channels, to less than one hundred from school classroom projects, annually.

CATCH ESTIMATES

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

Commercial Catch Estimates

The Fisheries Operating System (FOS) is the official salmon commercial fishery catch database for DFO in the 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 are manager-determined estimates based on resolution of all data sources.

Commercial catch estimates for 2017–2019 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 catch estimates (non-Steelhead) for 2017–2019 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 and are a provincial responsibility delegated from the Government of Canada. The B.C. management objectives for these fisheries are:

1. Maintain a diversity of sustainable recreational angling opportunities for steelhead in British Columbia.
2. Maintain, protect and restore the productive capacity of the freshwater environment to produce steelhead (B.C. Ministry of Forests, Lands and Natural Resource Operations, July 2014).

There has been no retention of wild steelhead in B.C. sport fisheries since April 1, 2007; recreational fisheries that currently operate on non-enhanced rivers are strictly catch and release. Recreational fisheries also occur in approximately 13 hatchery-augmented rivers, where an angler is allowed to harvest one fish per day (with a maximum 10 per season). Total catches are estimated via the Steelhead Harvest Analysis – a questionnaire mailed to 50% of all B.C. and 100% of non-B.C. residents who purchased a steelhead licence. Estimates are currently available up to the end of the 2017/2018 fiscal year (M. Beere, B.C. Ministry of Forests, Lands and

Natural Resource Operations, Smithers; pers. comm., March 12, 2019; Table 3). Data for 2018/2019 fiscal year were only available for the North Coast at the time of writing this report. Conservation concerns about two populations of Interior Fraser River steelhead led to emergency listings as "endangered" in January 2018. It is expected that actions taken as a result of this listing will impact future catches of steelhead in B.C. waters.

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 three to five 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 2017 (final) and 2018 (preliminary) is summarized in Table . Approximately 360.6, 261.9, and 384.4 million salmon were released, in 2017, 2018, and 2019, respectively. In these years, sockeye and chum releases accounted for the majority of enhanced production (84%, 77%, and 86% of total releases in 2017, 2018, and 2019, respectively). Since 2016, all thirteen hatcheries augmenting steelhead production have conducted smolt release programs, releasing approximately 354,000, 285,000, and 81,000 steelhead smolts in 2017, 2018, and 2019, respectively (Table 5).

It is not possible to conduct assessments of each enhancement project and/or release strategy individually. 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-rate estimates are used for time series analyses of both wild and enhanced populations. Enhanced contributions and survival rates 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 through sampling programs in the fisheries, on the spawning grounds and at enhancement sites. Visual marks are mainly characterized by the removal of the adipose fin, with some chinook and coho stocks also receiving an implanted coded wire tag to enable identification of stock and release year. Beginning in 1996, most enhanced coho from southern B.C. 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 and is reported separately.

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Table 1. Canadian commercial catch estimates of Pacific salmon (excluding steelhead) for 2017–2019, presented in pieces (000's) and weights (MT). Catches reported include First Nations commercial fisheries.

Reporting Area	Year	Commercial Catch Number (000's)						Commercial Catch Round Weight (MT)					
		Pink	Chum	Sockeye	Coho	Chinook	Total	Pink	Chum	Sockeye	Coho	Chinook	Total
Fraser River	2017	4.13	197.59	29.85	0.73	1.74	234.03	9.32	967.96	74.32	2.20	10.91	1064.71
	2018	0.04	9.74	1851.07	1.53	2.30	1864.68	0.09	48.37	4969.94	4.57	11.63	5034.60
	2019	9.57	3.92	231.51	0.26	4.26	249.53	18.74	22.93	2.96	0.79	25.50	70.92
South Coast	2017	37.24	760.23	11.00	0.46	0.06	808.99	82.80	3664.34	27.42	1.51	0.39	3776.47
	2018	97.27	224.06	1917.18	0.78	0.31	2239.59	178.08	999.76	5067.40	2.31	1.35	6248.89
	2019	13.61	5.22	5.53	0.16	0.22	24.75	29.64	30.53	13.55	0.48	1.39	75.58
West Coast Vancouver Island	2017	0.03	56.65	56.85	2.71	99.00	215.24	0.05	270.29	114.05	9.61	571.45	965.45
	2018	0.02	27.56	71.26	6.00	73.81	178.66	0.05	126.93	160.78	23.67	311.91	623.33
	2019	0.13	6.84	9.93	3.29	69.04	89.23	0.33	39.99	20.51	11.74	427.30	499.87
Central Coast	2017	748.33	333.26	0.77	8.35	3.15	1093.86	1662.14	1860.06	1.96	24.33	21.41	3569.90
	2018	48.48	452.44	3.56	0.00	4.60	509.09	107.90	2423.27	9.30		20.83	2561.31
	2019	10.07	146.03	0.25	0.65	6.09	163.09	21.41	857.26	0.63	1.95	44.93	926.19
North Coast	2017	835.92	77.32	50.38	84.75	1.93	1050.29	1854.52	396.36	125.81	262.48	10.96	2650.13
	2018	122.15	46.96	120.60	35.55	0.51	325.76	267.67	235.16	278.02	102.99	3.00	886.84
	2019	61.53	21.17	22.34	15.57	0.47	121.09	131.04	122.49	53.91	45.25	2.90	355.60
Haida Gwaii	2017	33.06	0.34		273.19	97.59	404.18	55.58	1.49	0.00	816.51	655.82	1529.39
	2018	27.97	3.18		142.19	70.28	243.62	62.58	14.52	0.01	411.62	472.18	960.91
	2019	56.42	0.90	0.01	163.59	42.80	263.71	133.52	3.71	0.03	469.25	311.08	917.59
Yukon / Transboundary	2017		2.40	63.10	13.20	1.30	80.00	0.00	8.49	154.56	54.49	7.84	225.38
	2018	0.10	0.53	35.27	13.19	0.00	49.09	0.13	1.89	69.83	43.56	0.00	115.41
	2019	0.00	1.73	32.21	17.37	0.00	51.31	0.00	6.16	63.77	57.37	0.00	127.30
Whole Country	2017	1658.69	1427.79	211.95	383.40	204.78	3886.60	3664.41	7169.00	498.12	1171.13	1278.78	13781.44
	2018	296.04	764.47	3998.94	199.24	151.80	5410.49	616.50	3849.91	10555.28	588.71	820.90	16431.30
	2019	151.33	185.82	301.78	200.89	122.88	962.70	334.69	1083.07	155.37	586.83	813.10	2973.06

Table 2. Canadian recreational catch estimates of Pacific salmon for 2017–2019, presented in pieces (000's).

Reporting Area	Year	Recreational Catch Numbers (000's)						
		Pink	**Chum**	**Sockeye**	**Coho**	**Chinook**	**Steelhead**	**Total**
South Coast	2017	29.34	5.21	0.24	29.32	111.90		176.02
	2018	4.73	5.85	159.10	44.35	124.69		338.72
	2019	54.54	0.52	0.04	18.95	81.57		155.62
West Coast Vancouver Island	2017	2.43	0.03	11.45	27.04	95.21		136.16
	2018	0.07	0.01	5.84	46.01	82.19		134.12
	2019	2.27	0.00	0.59	35.77	78.84		117.47
North Coast	2017	3.96	0.27	0.29	58.50	18.03	24.05	105.11
	2018	1.39	0.18	0.03	10.44	5.82	40.98	58.84
	2019	5.35	0.98	0.18	76.20	69.33		152.03
Haida Gwaii	2017	1.15	0.90	0.17	35.10	45.60		82.92
	2018	1.95	0.95	0.17	34.20	36.70		73.97
	2019	0.91	0.70	0.13	36.10	45.20		83.04
Whole Country	2017	36.88	6.41	12.15	149.97	270.75	24.05	500.20
	2018	8.14	6.98	165.14	135.00	249.41	40.98	605.65
	2019	63.07	2.20	0.93	167.02	274.93	0.00	508.15

Table 3. Canadian recreational catch estimates of steelhead since 2005/2006, presented in pieces (000's). Estimates for 2018/2019 not yet available. Total catches are estimated via the Steelhead Harvest Analysis (FLNRO 2014). B.C. Regions are defined as follows: 1=Vancouver Island; 2=Lower Mainland; 3=Thompson; 4=Kootenay; 5=Cariboo; 6=Skeena. Data provided by M. Beere, B.C. Ministry of Forests, Lands and Natural Resource Operations, Smithers.

	B.C. Region						
Year	1	2	3	5	6	Unknown	Annual Total
2005/2006	16.842	22.624	2.730	2.635	32.311	0.259	77.401
2006/2007	22.330	11.466	1.813	3.698	25.366	0.372	65.045
2007/2008	15.929	14.031	0.809	2.491	26.951	0.358	60.569
2008/2009	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009/2010	20.137	9.637	1.204	2.017	38.790	0.579	72.364
2010/2011	18.021	23.400	0.023	4.389	45.265	0.370	91.468
2011/2012	16.592	27.163	1.633	5.230	36.311	0.235	87.164
2012/2013	14.123	25.681	1.922	6.777	55.479	0.333	104.315
2013/2014	8.294	19.299	2.005	3.693	41.895	0.501	75.687
2014/2015	13.003	23.603	1.361	5.341	51.240	0.769	95.317
2015/2016	8.100	14.191	0.244	8.027	43.237	0.525	74.324
2016/2017	6.259	11.149	0.561	5.530	44.081	0.854	68.434
2017/2018	8.042	10.196	0.141	3.600	24.050	0.175	46.204

Table 4. Canadian subsistence catch estimates of Pacific salmon for 2017–2019, presented in numbers (000's).

Reporting Area	Year	Subsistence Numbers (000's)						
		Pink	**Chum**	**Sockeye**	**Coho**	**Chinook**	**Steelhead**	**Total**
South Coast	2017	46.35	82.68	71.65	16.59	30.56		247.83
	2018	3.94	78.15	872.87	1.82	36.35		993.13
	2019	8.92	8.10	261.08	2.41	8.92		289.42
West Coast Vancouver Island	2017	0.02	54.91	24.67	14.15	49.96		143.71
	2018		41.65	17.97	10.35	31.79		101.76
	2019	0.20	1.19	21.10	3.35	5.27		31.11
North Coast	2017	30.88	4.71	168.91	22.25	20.60	1.62	248.97
	2018	4.76	0.96	176.34	8.13	15.62	4.09	209.90
	2019	23.02	0.83	99.47	3.45	7.60	0.61	134.98
Haida Gwaii	2017			4.87				4.87
	2018	5.00	4.00	7.17		1.00		17.17
	2019							
Yukon / Transboundary	2017	0.00	3.30	9.40	0.80	1.10		14.60
	2018	0.00	2.87	5.43	0.03	3.27		11.60
	2019	0.00	2.03	6.15	0.11	3.72		12.02
Whole Country	2017	77.25	145.60	279.49	53.79	102.21	1.62	659.97
	2018	13.70	127.64	1079.78	20.32	88.04	4.09	1333.56
	2019	32.14	12.15	387.80	9.32	25.51	0.61	467.53

Table 5. DFO Salmon Enhancement Program and Fraser Valley Hatchery enhanced Pacific salmon releases in 2017–2019, presented in numbers (000's).

Reporting Area	Release Year	Enhanced Salmon Releases (000's)						
		Pink	Chum	Sockeye	Coho	Chinook	Steelhead	Total
B.C. Interior	2017			14,902	174	1,206		16,283
	2018			3,276	350	1,270		4,896
	2019			25,800	436	1,282		27,518
Fraser River	2017		9,382	1,488	1,786	2,229	193	15,079
	2018	526	13,274	25,729	1,760	2,249	198	43,736
	2019		9,875	16,327	1,931	2,396		30,529
South Coast	2017	11,044	82,156	257	3,771	14,428	68	111,724
	2018	14,195	27,780	530	4,121	15,006	48	61,680
	2019	9,319	16,406	353	4,162	15,015	33	45,288
West Coast Vancouver Island	2017		30,968		963	15,899	41	47,871
	2018		11,124		916	15,270	0	27,310
	2019		21,477		962	14,707		37,146
Central Coast	2017		9,257	133	30	2,429		11,849
	2018		8,619	63	73	2,363		11,118
	2019		7,551	60	66	2,644		10,321
North Coast	2017		1,767	152,634	682	2,224	52	157,358
	2018		883	109,063	845	1,948	39	112,778
	2019		1636	229,194	545	1,763	48	233,186
Haida Gwaii	2017		131		196	88		415
	2018		155		129	118		402
	2019		143		55	218		416
Whole Country	2017	11,044	133,661	169,414	7,603	38,503	354	360,579
	2018	14,721	61,835	138,661	8,194	38,224	285	261,920
	2019	9,319	57,088	271,734	8,157	38,025	81	384,404