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Summary of Non-coastal Salmon Catch Data from the North Pacific Ocean

by

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ABSTRACT

This document presents seasonal summaries of salmon catches from throughout the north Pacific. Data were assembled by a small group following the approval of the “2014 NPAFC-PICES Framework for Enhanced Scientific Cooperation in the North Pacific Ocean”, augmented as needed by country specific experts. Only data from beyond 22km of any coast line were included. Sampling took place during 1955-2014 and included catches from 32,355 sampling events (sets). Chum and pink salmon were the most frequently caught species; significant numbers of sockeye, coho and chinook salmon and steelhead were also caught. Preliminary data summaries are provided for seven regions separately for spring, summer, fall, and winter. These data will be useful to compare with results from future sampling planned as part of the International Year of the Salmon, and provide a basis for the application of climate downscaling models to predict salmon abundance and distribution under various climate forecasting scenarios.

INTRODUCTION

The primary focus of the 2016-2020 NPAFC Science Plan is to understand variations in Pacific salmon productivity in a changing climate (SSC 2016, Doc. 1665). The Science Plan is aligned to a large extent with the International Year of the Salmon (IYS) program (IYS Working Group 2016, Doc. 1663). A major theme for each is to better understand effects of factors influencing Pacific salmon and steelhead trout in a changing ocean.

In 2014, the “NPAFC-PICES Framework for Enhanced Scientific Cooperation in the North Pacific Ocean” (http://www.npafc.org/new/about_organizations.html) was approved by PICES and NPAFC. As a result of this framework, a small group was formed (see Acknowledgements) to forecast future seasonal distributions of Pacific salmon under climate change. The group assembled non-coastal salmon catch data from the North Pacific with an emphasis on older data. The purpose of this report is to provide some preliminary findings from this work.

CATCH SUMMARIES

Catch data from U.S., Canadian, Russian and Japanese surveys more than 22km from any coast line were assembled. Data holdings from individual team members were augmented by data from various publications and provided by other regional experts (see Acknowledgements). The precise location (i.e. latitude and longitude) and date (spring = March, April, May; summer = June, July, August; fall = September, October, November; and winter = December, January, February) of each sampling event enabled us to align each dataset into one of seven regions and four seasons. Sea surface temperature and salinity data were documented whenever available but are not provided here.

Seasonal summaries are provided for major regions in the eastern North Pacific Ocean (Table 1) and central and western North Pacific Ocean (Table 2). Sampling took place during 1955-2014

and included catches from 32,355 sampling events (sets). Chum and pink salmon were the most frequently caught species; significant numbers of sockeye, coho and chinook salmon and steelhead were also caught. Preliminary data summaries are provided for seven regions separately for spring, summer, fall, and winter. These data will be useful to compare with results from future sampling planned as part of the International Year of the Salmon, and provide a basis for the application of climate downscaling models to predict salmon abundance and distribution under various climate forecasting scenarios.

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Table 1. CPUE (number of fish/set) statistics (standard error, median, standard deviation) for sampling in regions of the eastern North Pacific Ocean. Sets are sampling events. Count is the number of season/year combinations for that region (e.g. count = 37 would mean 37 separate annual estimates for that season and location).

Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead
Bering Sea - Spring							Northern Gulf of Alaska - Spring							Southern Gulf of Alaska - Spring						
Mean	141.00	63.77	68.90	0.02	3.98	0.00	Mean	35.44	20.66	7.98	1.49	0.25	0.53	Mean	17.96	21.94	18.46	5.21	0.55	2.50
SE	32.23	8.11	17.29	0.01	1.22	0.00	SE	11.00	11.02	1.71	0.96	0.13	0.30	SE	4.29	5.33	4.14	1.69	0.25	0.74
Median	67.24	52.77	31.08	0.00	1.25	0.00	Median	20.70	6.98	8.89	0.18	0.06	0.09	Median	13.80	10.49	13.81	2.33	0.13	1.30
SD	196.05	49.36	105.18	0.07	7.45	0.01	SD	55.00	55.08	8.54	4.79	0.67	1.49	SD	21.04	26.09	20.26	8.28	1.21	3.63
Sets	1360	1360	1360	1360	1360	1360	Sets	1373	1373	1373	1373	1373	1373	Sets	775	775	775	775	775	775
Count	37	37	37	37	37	37	Count	25	25	25	25	25	25	Count	24	24	24	24	24	24
Bering Sea - Summer							Northern Gulf of Alaska - Summer							Southern Gulf of Alaska - Summer						
Mean	45.11	103.88	63.31	0.97	3.67	0.00	Mean	73.81	49.76	35.96	17.03	1.00	4.44	Mean	17.52	16.50	13.83	5.46	0.92	3.19
SE	16.74	12.34	16.82	0.31	0.67	0.00	SE	10.76	7.84	5.55	3.05	0.21	0.67	SE	3.96	3.31	4.62	1.73	0.37	1.05
Median	21.92	82.20	8.24	0.13	1.53	0.00	Median	72.14	30.69	24.00	4.52	0.54	2.88	Median	8.29	12.00	2.00	1.50	0.00	1.09
SD	124.15	91.53	124.74	2.29	4.98	0.01	SD	68.08	49.61	35.10	19.31	1.33	4.24	SD	22.04	18.45	25.73	9.66	2.04	5.87
Sets	3446	3446	3446	3446	3446	3446	Sets	1506	1506	1506	1506	1506	1506	Sets	326	326	326	326	326	326
Count	55	55	55	55	55	55	Count	40	40	40	40	40	40	Count	31	31	31	31	31	31
Bering Sea - Fall							Northern Gulf of Alaska - Fall							Southern Gulf of Alaska - Fall						
Mean	13.63	28.88	97.90	0.80	1.74	0.00	Mean	4.98	0.35	0.11	0.37	0.00	0.19	Mean	27.91	14.54	0.38	1.48	0.08	0.69
SE	4.06	7.88	40.13	0.29	0.49	0.00	SE	4.40	0.29	0.11	0.27	0.00	0.19	SE	27.86	14.32	0.38	0.89	0.08	0.40
Median	9.10	21.22	10.58	0.50	1.27	0.00	Median	0.00	0.00	0.00	0.00	0.00	0.00	Median	0.07	0.33	0.00	0.96	0.00	0.63
SD	14.65	28.39	144.70	1.03	1.76	0.00	SD	17.58	1.17	0.44	1.08	0.00	0.75	SD	55.73	28.64	0.75	1.78	0.17	0.80
Sets	345	345	345	345	345	345	Sets	198	198	198	198	198	198	Sets	16	16	16	16	16	16
Count	13	13	13	13	13	13	Count	16	16	16	16	16	16	Count	4	4	4	4	4	4
Bering Sea - Winter							Northern Gulf of Alaska - Winter							Southern Gulf of Alaska - Winter						
Mean	18.78	0.10	0.00	0.00	0.00	0.00	Mean	29.19	1.65	0.51	0.18	0.03	0.03	Mean	28.39	7.15	1.08	2.16	0.01	0.60
SE	12.03	0.10	0.00	0.00	0.00	0.00	SE	9.70	1.26	0.20	0.11	0.01	0.02	SE	9.99	4.17	0.36	1.07	0.01	0.27
Median	18.78	0.10	0.00	0.00	0.00	0.00	Median	9.79	0.18	0.04	0.00	0.00	0.00	Median	19.62	0.73	0.50	0.36	0.00	0.27
SD	17.01	0.14	0.00	0.00	0.00	0.00	SD	38.79	5.03	0.80	0.45	0.05	0.06	SD	34.61	14.45	1.25	3.71	0.03	0.94
Sets	26	26	26	26	26	26	Sets	151	151	151	151	151	151	Sets	89	89	89	89	89	89
Count	2	2	2	2	2	2	Count	16	16	16	16	16	16	Count	12	12	12	12	12	12

Table 2. CPUE (number of fish/set) statistics (standard error, median, standard deviation) for sampling in regions of the central and western North Pacific Ocean. Sets are sampling events. Count is the number of season/year combinations for that region (e.g. count = 47 would mean 47 separate annual estimates for that season and location).

Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Statistic	Sockeye	Chum	Pink	Coho	Chinook	Steelhead
Central Pacific - Spring							Western Pacific - Spring							Sea of Okhotsk - Spring						
Mean	30.92	39.81	39.40	10.73	0.62	0.98	Mean	7.84	53.10	201.44	1.65	0.44	0.20	Mean	6.26	232.68	247.99	0.03	1.96	0.01
SE	3.66	3.65	6.12	1.65	0.09	0.19	SE	1.79	6.57	36.21	0.32	0.08	0.17	SE	2.65	88.91	104.72	0.01	0.73	0.01
Median	27.94	35.95	23.63	7.76	0.29	0.68	Median	1.94	42.84	131.50	0.64	0.16	0.00	Median	0.00	4.50	5.45	0.01	0.00	0.00
SD	25.11	25.01	41.95	11.32	0.61	1.31	SD	13.53	49.58	273.36	2.39	0.59	1.30	SD	9.19	308.01	362.74	0.05	2.53	0.02
Sets	5900	5900	5900	5900	5900	5900	Sets	5906	5906	5906	5906	5906	5906	Sets	337	337	337	337	337	337
Count	47	47	47	47	47	47	Count	57	57	57	57	57	57	Count	12	12	12	12	12	12
Central Pacific - Summer							Western Pacific - Summer							Sea of Okhotsk - Summer						
Mean	43.81	43.21	26.65	21.77	1.70	1.00	Mean	13.92	36.76	261.01	21.09	1.38	0.44	Mean	19.07	119.32	290.59	22.63	0.96	0.20
SE	5.46	3.69	6.61	3.33	0.24	0.12	SE	2.78	4.60	56.30	3.35	0.26	0.09	SE	5.19	30.23	73.98	5.72	0.24	0.20
Median	42.14	37.61	9.43	11.92	1.08	0.88	Median	5.45	36.53	50.19	13.18	0.69	0.14	Median	9.88	36.65	89.17	14.73	0.31	0.00
SD	38.97	26.37	47.21	23.79	1.68	0.88	SD	19.29	31.90	390.08	23.24	1.79	0.64	SD	26.99	157.06	384.43	29.73	1.22	1.02
Setgs	4626	4626	4626	4626	4626	4626	Sum	2682	2682	2682	2682	2682	2682	Sets	1703	1703	1703	1703	1703	1703
Count	51	51	51	51	51	51	Count	48	48	48	48	48	48	Count	27	27	27	27	27	27
Central Pacific - Fall							Western Pacific - Fall							Sea of Okhotsk - Fall						
Mean	39.95	15.41	5.90	0.84	0.21	0.24	Mean	5.27	23.67	8.54	1.52	0.58	0.00	Mean	27.47	2.59	61.32	183.63	0.70	0.49
SE	16.10	6.29	5.88	0.55	0.09	0.24	SE	1.81	9.66	5.08	0.79	0.20	0.00	SE	6.86	1.34	18.88	52.57	0.29	0.43
Median	44.40	17.92	0.00	0.33	0.33	0.00	Median	0.43	4.43	0.00	0.00	0.19	0.00	Median	19.00	0.00	39.00	178.35	0.20	0.00
SD	36.01	14.05	13.15	1.22	0.20	0.54	SD	7.87	42.12	22.13	3.42	0.86	0.00	SD	26.57	5.18	73.13	203.61	1.13	1.65
Sets	32	32	32	32	32	32	Sets	133	133	133	133	133	133	Sets	412	412	412	412	412	412
Count	5	5	5	5	5	5	Count	19	19	19	19	19	19	Count	15	15	15	15	15	15
Central Pacific - Winter							Western Pacific - Winter							Between 35-45N and 128-141N - Fall						
Mean	51.90	24.67	5.25	0.70	0.33	0.01	Mean	4.74	13.53	25.67	0.00	0.10	0.00	Mean	0.00	0.01	11.90	0.00	0.00	0.00
SE	22.10	12.25	2.66	0.37	0.20	0.01	SE	2.24	7.08	10.83	0.00	0.09	0.00	SE	0.00	0.01	11.90	0.00	0.00	0.00
Median	19.63	5.40	0.18	0.00	0.11	0.00	Median	0.56	1.19	12.14	0.00	0.00	0.00	Median	0.00	0.00	0.00	0.00	0.00	0.00
SD	76.57	42.43	9.20	1.27	0.68	0.02	SD	8.97	28.33	43.30	0.00	0.35	0.00	SD	0.00	0.02	20.60	0.00	0.00	0.00
Sets	156	156	156	156	156	156	Sets	206	206	206	206	206	206	Sets	95	95	95	95	95	95
Count	12	12	12	12	12	12	Count	16	16	16	16	16	16	Count	3	3	3	3	3	3
Between 35-45N and 128-141N - Spring							Between 35-45N and 128-141N - Summer													
Mean	6.18	5.93	5.34	0.55	0.06	0.18	Mean	4.43	9.92	3.23	0.87	0.14	0.61							
SE	3.74	3.87	1.76	0.36	0.05	0.13	SE	2.02	4.07	1.44	0.49	0.06	0.27							
Median	0.00	0.08	4.00	0.00	0.00	0.00	Median	0.00	0.00	0.00	0.00	0.00	0.00							
SD	11.83	12.23	5.55	1.15	0.16	0.42	SD	6.07	12.20	4.32	1.46	0.18	0.81							
Sets	164	164	164	164	164	164	Sets	299	299	299	299	299	299							
Count	10	10	10	10	10	10	Count	9	9	9	9	9	9							