The 2014 Southeast Alaska pink salmon forecast from the Southeast Coastal Monitoring (SECM) research project

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Researchers from the Auke Bay Laboratories (ABL) of the Alaska Fisheries Science Center (AFSC) have provided forecasting information to stakeholders of the pink salmon resource of Southeast Alaska (SEAK) since 2004. The forecasting parameters used by ABL are derived from an ongoing time series of data collected by the Southeast Coastal Monitoring (SECM) project. Initiated in 1997, the SECM project primarily samples eight stations in the vicinity of Icy Strait. Monthly oceanographic sampling occurs in May, June, July, and August annually, with surface trawling for juvenile salmon in the latter three months. Pink salmon forecasts using the SECM data enable stakeholders to anticipate the harvest with more certainty than previous forecasting methods have allowed. In eight of the past ten years, the SECM forecast estimates have deviated from the actual harvests by an average of only 7%. The Alaska Department of Fish and Game (ADFG) pink salmon harvest forecast for SEAK (developed by a different method) is also refined by using SECM juvenile pink salmon catch data. Researchers continue to explore ways to use the SECM data and other ecosystem indicators to improve forecast models as the time series is extended.

SECM forecast models	Adj. R^2	AICc	Regression *P* value	Prediction for 2014
(1-parameter) Peak $CPUE_{cal}$	67%	135.8	< 0.001	30.0 M (26-37 M)
(2-parameter) **Peak $CPUE_{cal}$ + $ISTI_{20m\ temp}$**	77%	131.2	< 0.001	**29.9 M** **(26-38 M)**

The table above indicates the two best SECM forecast models for the 2014 SEAK pink salmon harvest, with 80% bootstrap confidence intervals shown in parentheses. The 2-parameter model is the best fit predictor for the relationship of the 17-year time series of SECM data parameters to subsequent SEAK pink salmon harvests from 1998 to 2013, based on the R^2 and AIC_c.

Additional evidence from SECM research and other indicators (see back) suggest a ***low pink salmon harvest of 30 M fish in SEAK for 2014***. The strongest signal is that the 2013 peak juvenile pink $CPUE_{cal}$ (vessel calibration method) was the fourth lowest on record. In addition to this low $CPUE_{cal}$, five other poor-average ecosystem indicators--also significantly correlated to SEAK pink harvest--occurred in 2013: an average peak pink $CPUE_{ttd}$ (trawl track distance method), an average peak seaward migration month (July), a low percentage of pink salmon (9%) represented in the composite juvenile salmon catches, a likely adverse predation impact due to relatively high adult coho total abundance compared to peak juvenile pink $CPUE_{ttd}$, and an average North Pacific Index value (16.0). In concert, these six significant ecosystem indicators were each rank-scored and totaled across years. Of the overall ranked scores (1st=best and 17th=worst), ***ecosystem conditions in the 2013 ocean year ranked among the lowest (13th) over the 17 year time series*** (see ecosystem metric table on next page). Finally, during the past four years of surveys conducted up to 30 mi offshore in the eastern Gulf of Alaska, juvenile pink salmon $CPUE_{ttd}$ in July of 2013 was the lowest of all four years suggesting low production southward and coastward from the Icy Strait SECM index locality.

Pink salmon parent brood year				Chronological ecosystem variables										Pink salmon harvest	
Brood year (BY)	SEAK pink harvest (M)	Adult pink escapement index for SEAK		Ocean entry year (BY lagged 1 yr later)	Auke Creek fry outmigration (1,000s) Lat 58°N	Upper 1-20 m avg. Icy Strait temp. "ISTI" May-Aug	Juvenile peak pink (CAL) CPUE June or July	Juvenile peak pink (TTD) CPUE June or July	Peak seaward migration month	Proportion of pink in trawl hauls in June-July-Aug	Adult coho predation impact Coho total #s/J-pink CPUE	North Pacific Index (June, July, Aug)	Rank score of avearges of the six significant variables	SEAK pink harvest (M) (BY lagged 2 yrs later)	SEAK pink harvest (M) (response variable)
Data source	***ADFG 1***	***ADFG 2***			***NOAA 1***	***NOAA 2***	***NOAA 2***	***NOAA 2***	***NOAA 2***	***NOAA 2***	***NOAA 2 ADFG 3***	***CGD***			***ADFG 1***
1996	64.6	18.1		1997	31.1	9.5	2.5	2.2	July	12%	1.4	15.6	9	1998	42.4
1997	28.9	14.8		1998	60.8	9.6	5.6	5.3	June	57%	0.8	18.1	1	1999	77.8
1998	42.4	14.3		1999	53.5	9.0	1.6	1.4	July	8%	3.4	15.8	14	2000	20.2
1999	77.8	27.3		2000	132.1	9.0	3.7	3.3	July	18%	0.9	16.9	5	2001	67.0
2000	20.2	10.8		2001	61.5	9.4	2.9	2.6	July	19%	1.8	16.8	8	2002	45.3
2001	67.0	18.6		2002	150.1	8.6	2.8	2.5	July	14%	2.2	15.6	10	2003	52.5
2002	45.3	16.6		2003	95.1	9.8	3.1	2.7	July	24%	1.6	16.1	7	2004	45.3
2003	52.5	20.0		2004	169.6	9.7	3.9	3.4	June	29%	1.2	15.1	3	2005	59.1
2004	45.3	15.7		2005	87.9	10.3	2.0	1.7	Aug	19%	2.8	15.5	15	2006	11.6
2005	59.1	19.9		2006	65.9	8.9	2.6	2.3	June	30%	1.7	17.0	6	2007	44.8
2006	11.6	10.2		2007	81.9	9.3	1.2	1.0	Aug	9%	3.0	15.7	17	2008	15.9
2007	44.8	17.6		2008	117.6	8.3	2.5	2.2	Aug	14%	1.9	16.1	11	2009	38.0
2008	15.9	9.5		2009	34.8	9.6	2.1	2.7	Aug	22%	2.2	15.1	12	2010	24.0
2009	38.0	12.7		2010	121.6	9.6	3.7	5.0	June	66%	1.3	17.6	2	2011	58.9
2010	24.0	11.2		2011	30.9	8.9	1.4	1.6	Aug	21%	4.6	15.7	16	2012	21.3
2011	58.9	14.3		2012	61.8	8.7	3.2	4.3	July	40%	1.5	16.7	4	2013	94.7
2012	21.3	11.0		**2013**	51.2	9.2	1.9	2.7	July	9%	3.7	16.0	13	**2014**	**?**
Harvest correlations	0.46	0.38			0.29	-0.20	0.81	0.84	-0.65	0.66	-0.75	0.61	Pearson correlation "*r*"		
Probability value=	0.07	0.15			0.28	0.46	0.00*	0.00*	0.01*	0.01*	0.00*	0.01*	(*=significant@<0.05)		

Data sources: ADFG (S. Heinl$_1$, A. Piston$_2$, and L. Shaul$_3$), CGD = Climate & Global Dynamics (J. Hurrell, http://www.cgd.ucar.edu/cas/jhurrell/indices.data.html), & NOAA Auke Bay Laboratories (J. Joyce$_1$ - Auke Creek research station & E. Fergusson/J. Orsi/M. Sturdevant$_2$ - Southeast Coastal Monitoring project)

Above are selected ecosystem metrics associated with SEAK adult pink salmon harvest over the 17-year SECM time series. Value ranges for each metric are color-coded: they are typically the highest six values in green, the lowest 6 values in red, and the 5 intermediate values in yellow. The bottom two rows show correlation coefficients "*r*" of the association of the ecosystem variables to the response variable of harvest (green shaded values are significant, *P*-value<0.05). Of the six variables significantly correlated with harvest, a stoplight chart of annual ranked scores (1 to 17) is shown for each of the composite ocean years. Note that conditions in 2013 were ranked 13th out of the 17 years (1st=best and 17th=worst).

For more details about the SECM pink salmon forecasts refer to: http://www.afsc.noaa.gov/ABL/MSI/msi_sae_psf.htm

If this research is of value to you, we encourage you to contact any of these NOAA research managers:

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