

NOAA **FISHERIES**

Alaska Fisheries Science Center

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Meteorological and oceanographic factors predict salmon timing: research in support of operational forecasting

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Ocean, Atmosphere, Hydrosphere, and Land Surface Interaction in the Coastal Environment 11th Symposium on the Coastal Environment (4:15 PM TJ8.2) American Meteorological Society 93rd Annual Meeting Austin, TX, January 7, 2013





Research Questions

Do climate-related factors control the abundance, distribution or *behavior* of fish populations?

Would fish populations change in abundance, distribution or *behavior* in response to climate change?

Would *fishery management* need to change in response to climate change?









http://water.usgs.gov/nasqan/docs/yukonfact/images/fig1.jpg



Covariation in Ice Cover and Salmon Timing

Normalized Deviations fr Mean Timing Quartile and Mean Spring Ice Cover



Looking for the Needle in the Haystack Yukon Chinook Timing Observed 1980 - 2012







LINEAR MODELING – 50% POINT w/ AIR AND SEA SURFACE TEMPS MDJ = (-0.410)AMATC + (-1.638)MSSTC + 17.357



NON-LINEAR MODELING – 50% POINT w/ EMMONAK VARIABLES MDJ = f(WIND & ICE & AIR TEMPERATURE)





Research Forecasting (Linear Model) 2010 - 2011

2010 - Outlook - May 31, 2010 - LATE

15 % Forecast June 17 50 % Forecast June 24 15% Observed June 1750% Observed June 25

2011 - Outlook - June 3, 2011 - AVG - LATE

15 % Forecast June 1650 % Forecast June 24

15% Observed June 15 50% Observed June 21



Comparison of Operational to Research Forecasts in 2012

Operational Forecasting (Linear Model) 2012 2012 Outlook Issued May 31, 2010 = LATE

Percent	Forecasts	Observed (CPUE)	DEV (days)
15% (FIFDJ)	June 17	June 22	5
25% (QDJ)	June 20	June 26	6
50% (MDJ)	June 25	July 2	7

Research Forecasting (Nonlinear Model) 2012

Percent	Forecasts	Observed (CPUE)	DEV (days)
15% (FIFDJ)	June 19	June 22	3
50% (MDJ)	June 27	July 2	5



Summary

- Proof of concept: Meteorological variables provide operational forecasts of salmon timing
- Nonlinear statistical models work better than linear in some cases
- Local met data improve model fit

Next Steps

- Stat Models: Different types of met and ocean data at different locations
- Physical models: 3-D Circulation











THE END







