

# Use of Ocean Observations to Develop Forecasts in Support of Fisheries Management

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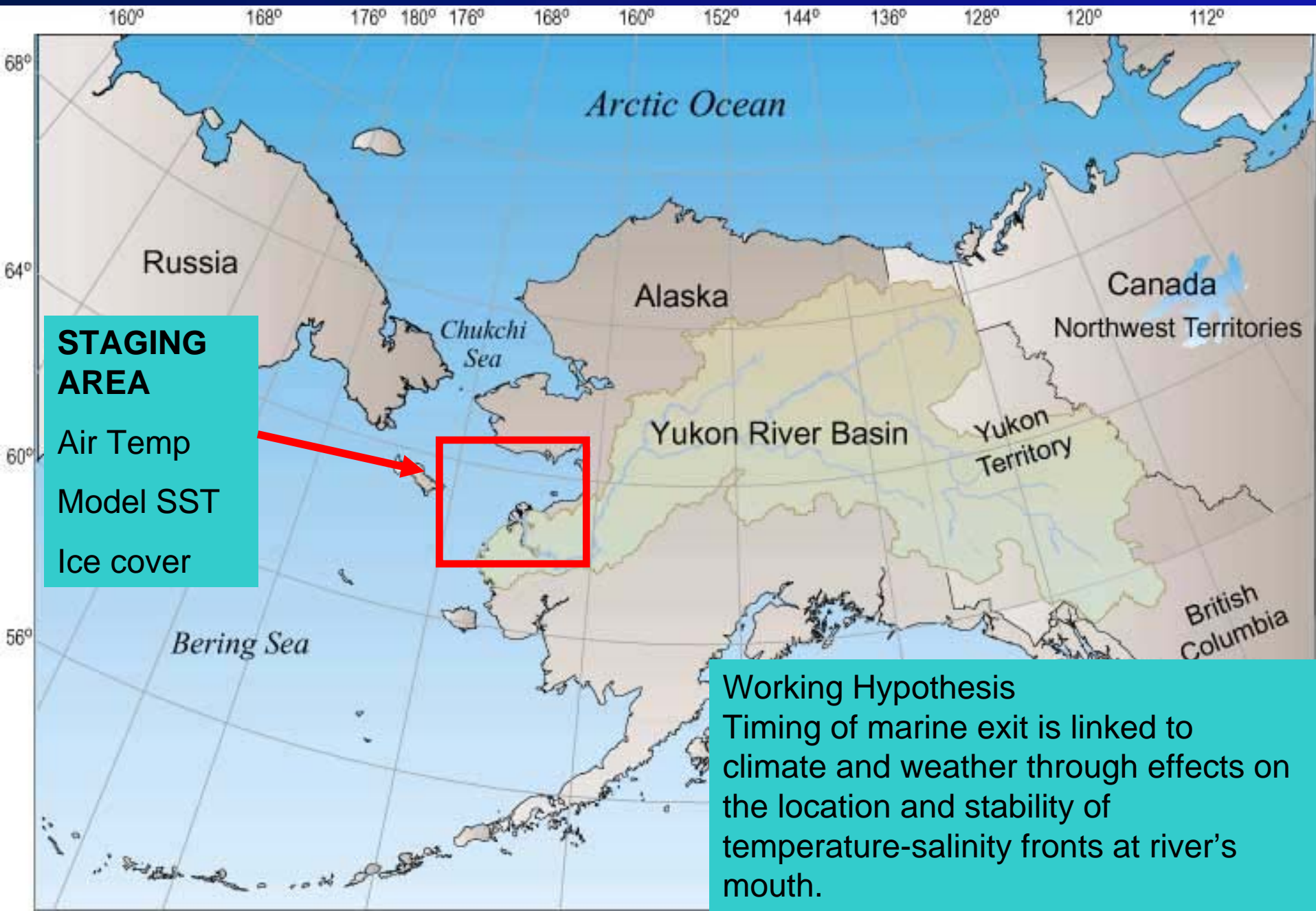


PICES Annual Meeting  
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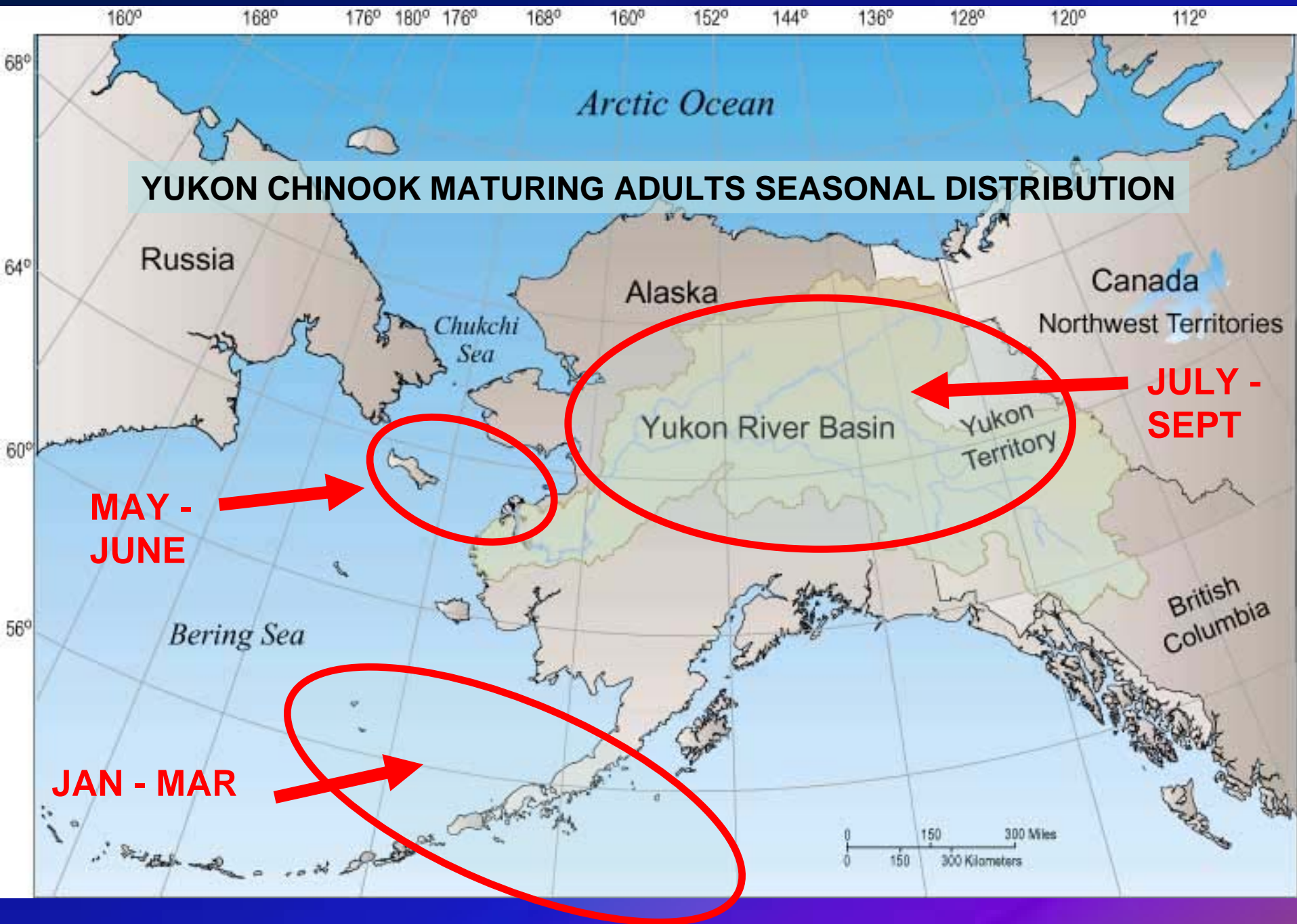




# Timing of Adult Yukon Chinook Linked to Weather and Climate







# Objectives

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- Examine the evidence for environmental control of migratory timing
  - Sea ice cover
  - Sea surface temperature (SST)
  - Mean air temperature
- Forecast marine exit timing for inriver fisheries management

# Yukon River Fishery Characteristics

## \*A Large River System

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***Mixed Stock Fishery*** – multiple stocks vulnerable to harvest at the same time and place.

***Gauntlet Fishery*** – exposed to harvest pressures over a long distance.

***Multiple Use Fishery*** – many different user groups competing for use of the resource.

## \*Remote Environment

# Yukon River Demographics

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Population: 43 Villages => 13,600 people  
Fairbanks Borough Area => 85,000 people.

Commercial Fishermen: 930 permits for combined gear types and locations.

Personal Use Fishermen: 115 permits annually for the Fairbanks Area.

Sport Fishermen: Roughly 40,000

Canadian Users: ??

(aboriginal, domestic, commercial, sport fisheries)

# Goals of Alaska Salmon Management

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- ❑ Manage Alaska's fisheries resources based on sound science, good management principles, and a fair and open public process.
- ❑ Provide for subsistence harvest of fisheries as the priority use consistent with the sustained yield principle.
- ❑ Provide for healthy, sustainable, and economically viable commercial fisheries.

**Management Objective** => **SY** in  
accordance with the *Policy for the Management  
of Sustainable Salmon Fisheries*



# Yukon River Salmon Agreement

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## Treaty components:

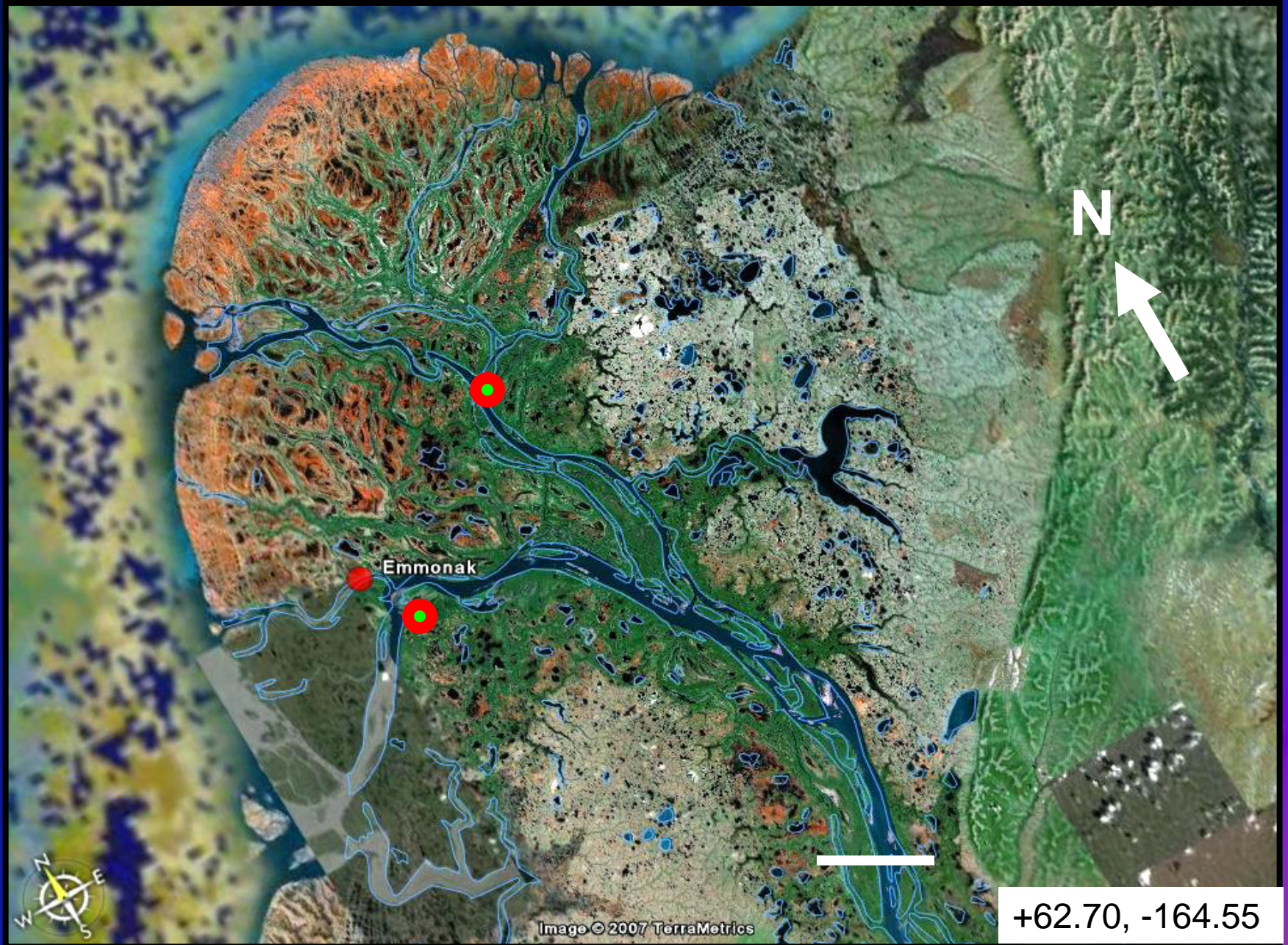
- Escapement goal
- Harvest sharing agreement

# Long Time Series of Adult Yukon Chinook Observations





# Lower Yukon Area





# Test Fisheries:

**Big Eddy**

**Middle Mouth**

Daily Observations

June-July

1979 - present

## Biological Sampling, ASL



## Set Gillnet



## Drift Gillnet



# Inseason Management Considerations

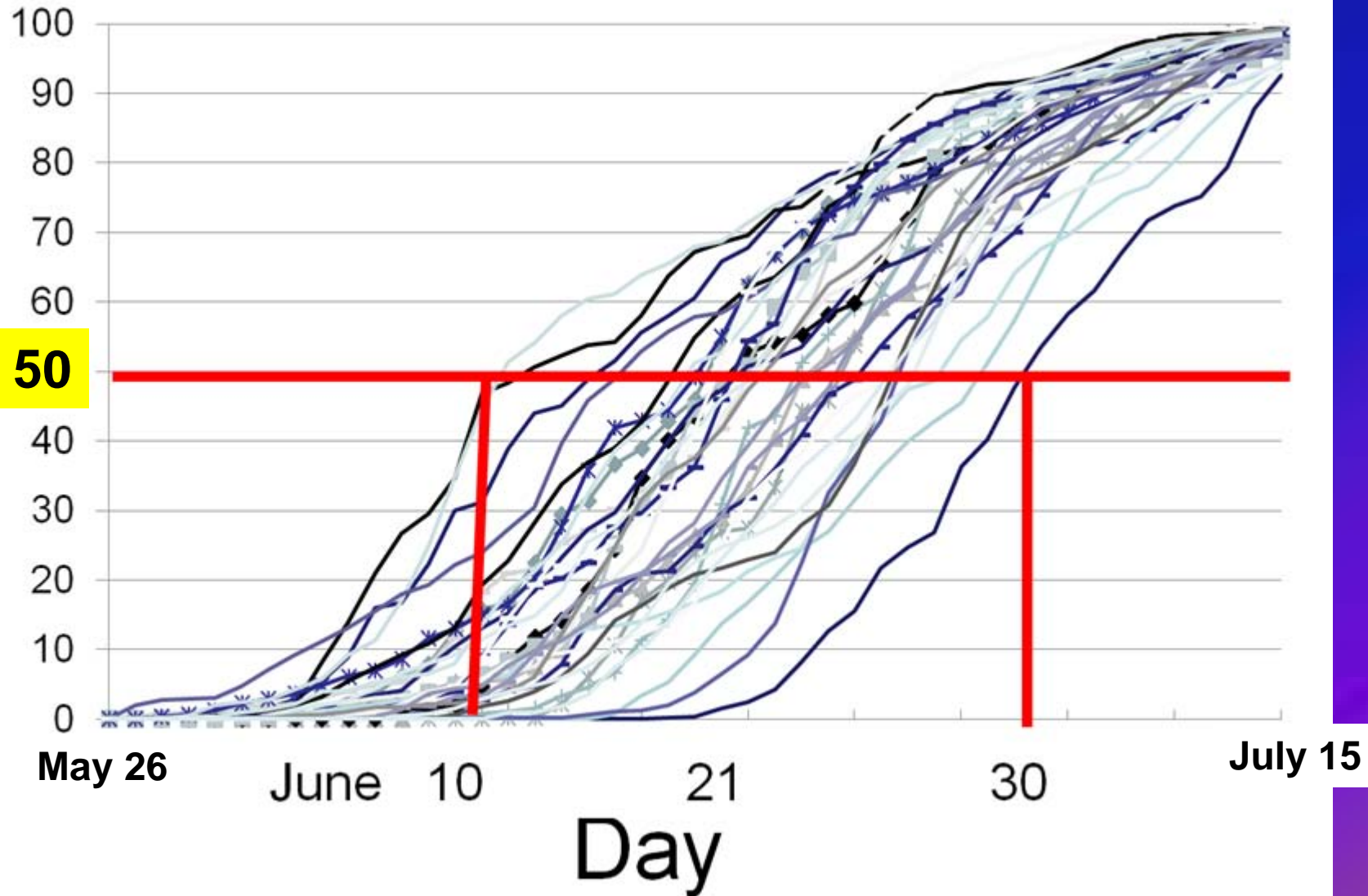
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- Run-timing and abundance
- Status of subsistence harvests
- Mixed-stock fishery/spread harvest out
- Efficiency of the fleet
- Potential for incidental harvest
- Capacity of buyers
- Flight schedule

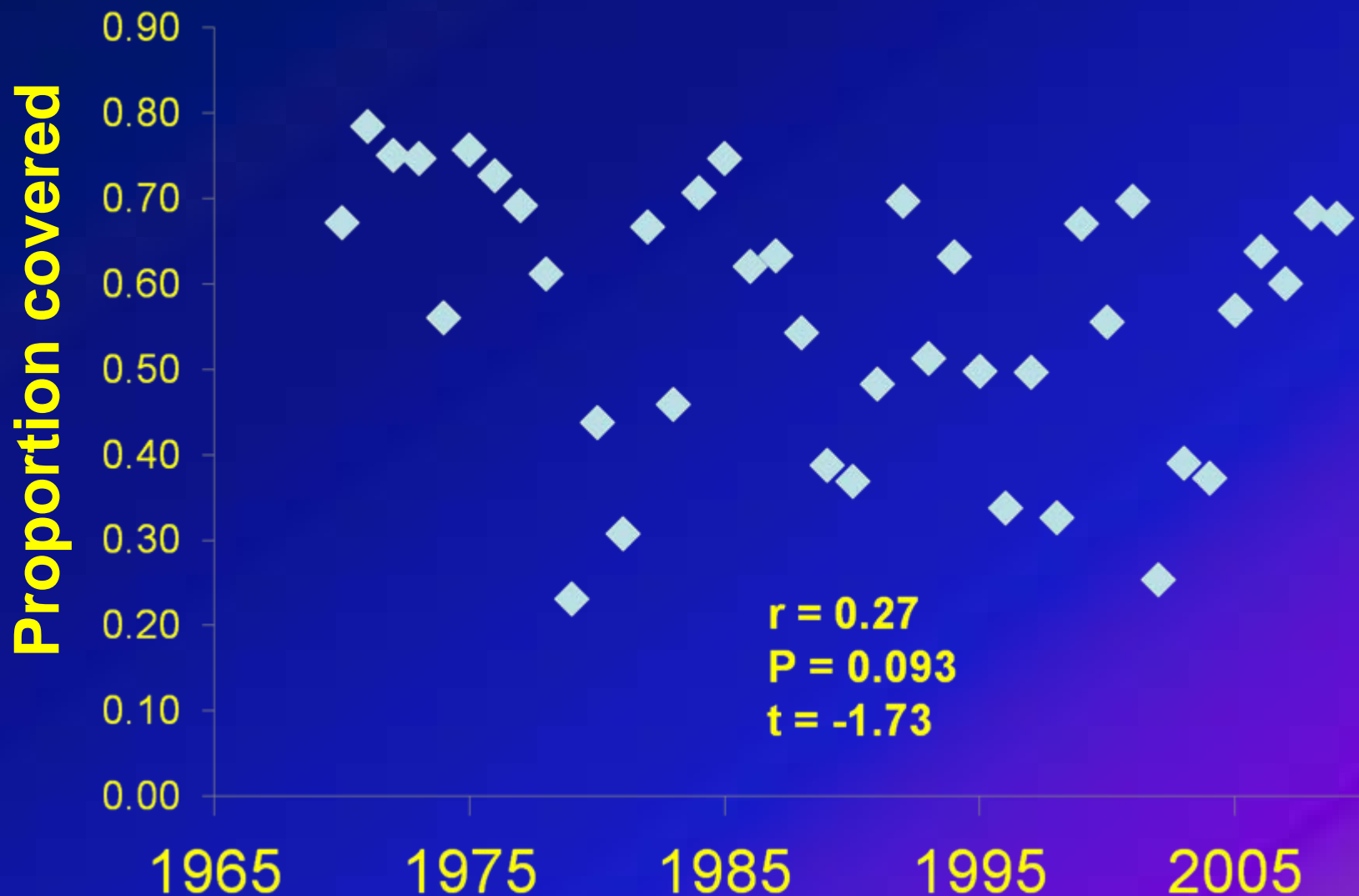


# Run Timing 1961-2010

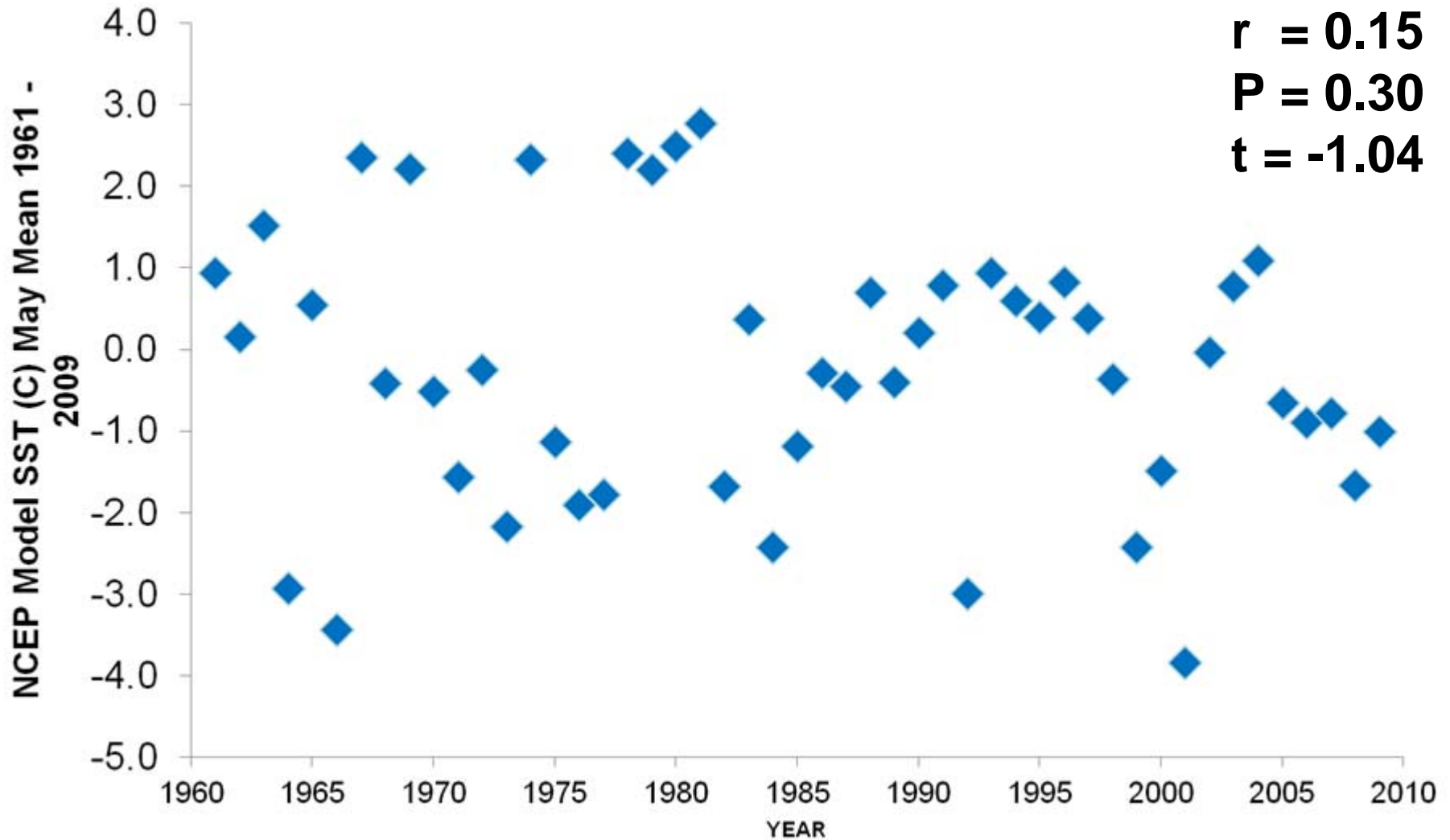
Cumulative Percent CPUE



# Average Proportion Ice Cover 1970 - 2009 (62 ° N - 63 ° N by 166 ° W - 169 ° W), March 20 – June 1

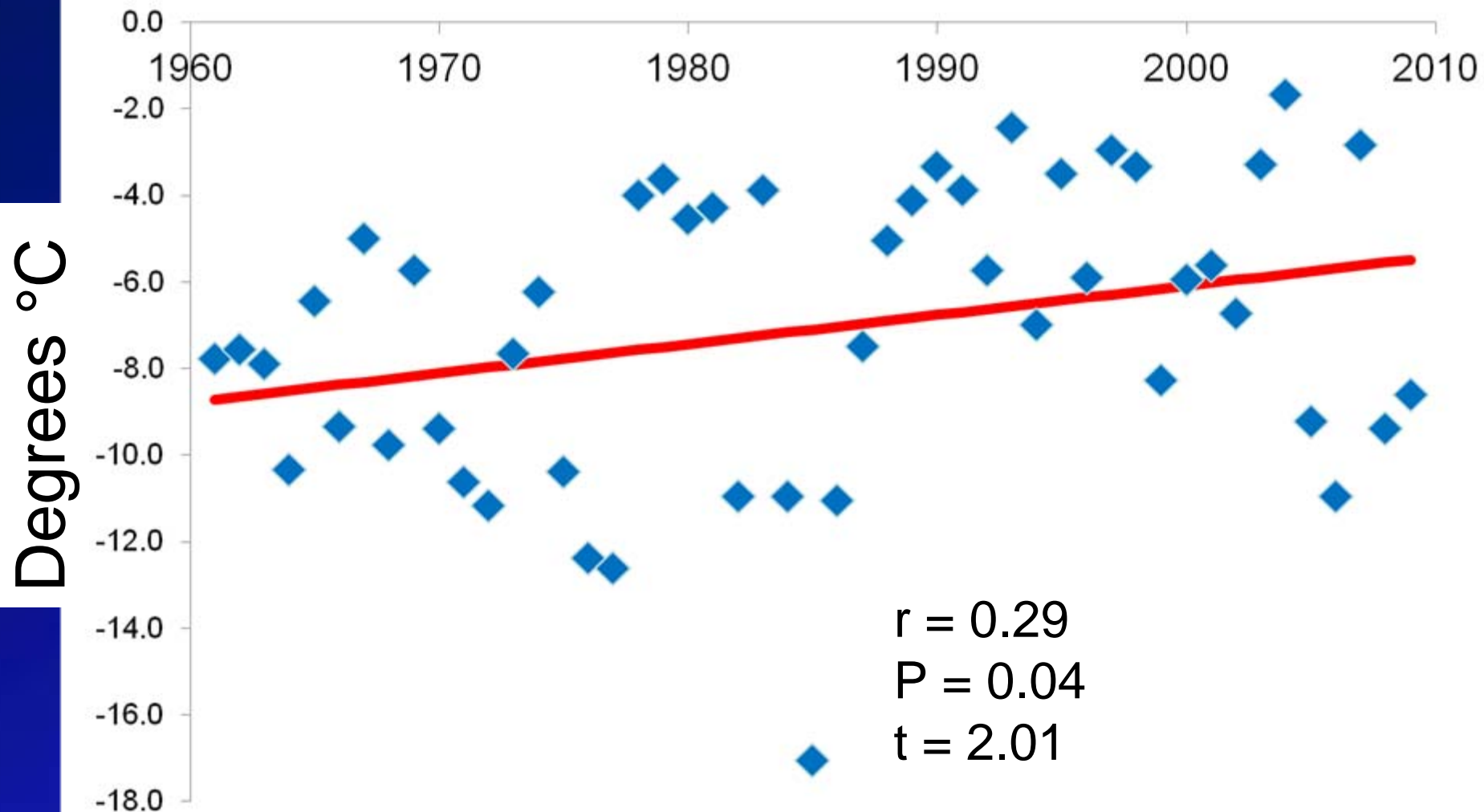


# NCEP Model May Mean SST 63.1 ° N and 165.5 ° W



# April Mean Air Temperature (°C) 1961 - 2009

## Nome, Alaska 64.5 N 165.4 W



# Results

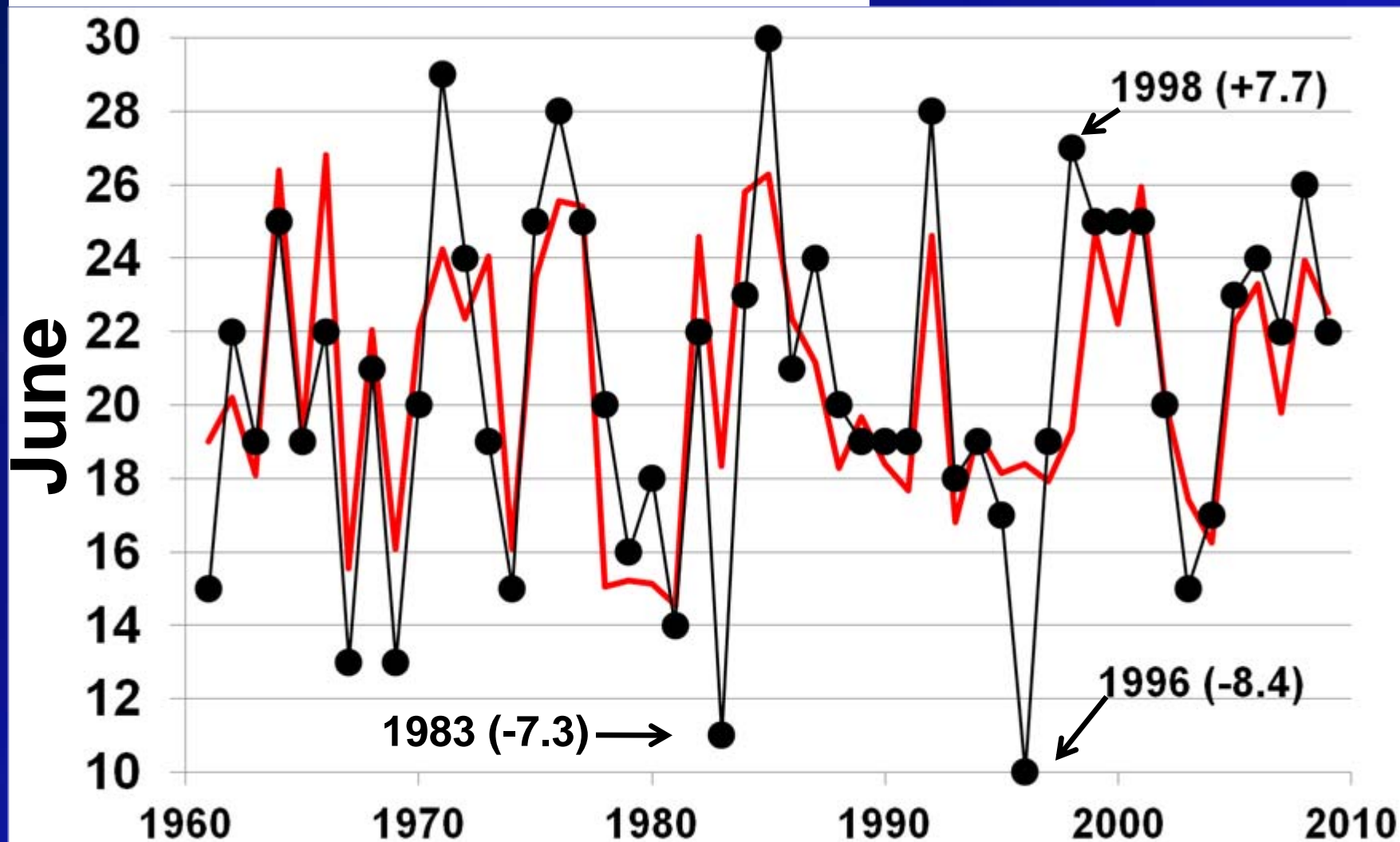
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- Annual migratory timing is explained by:
  - SST (53%)
  - Spring ice cover (44%)
  - Spring air temps (35%)
- The best linear model uses only temperatures, not ice cover



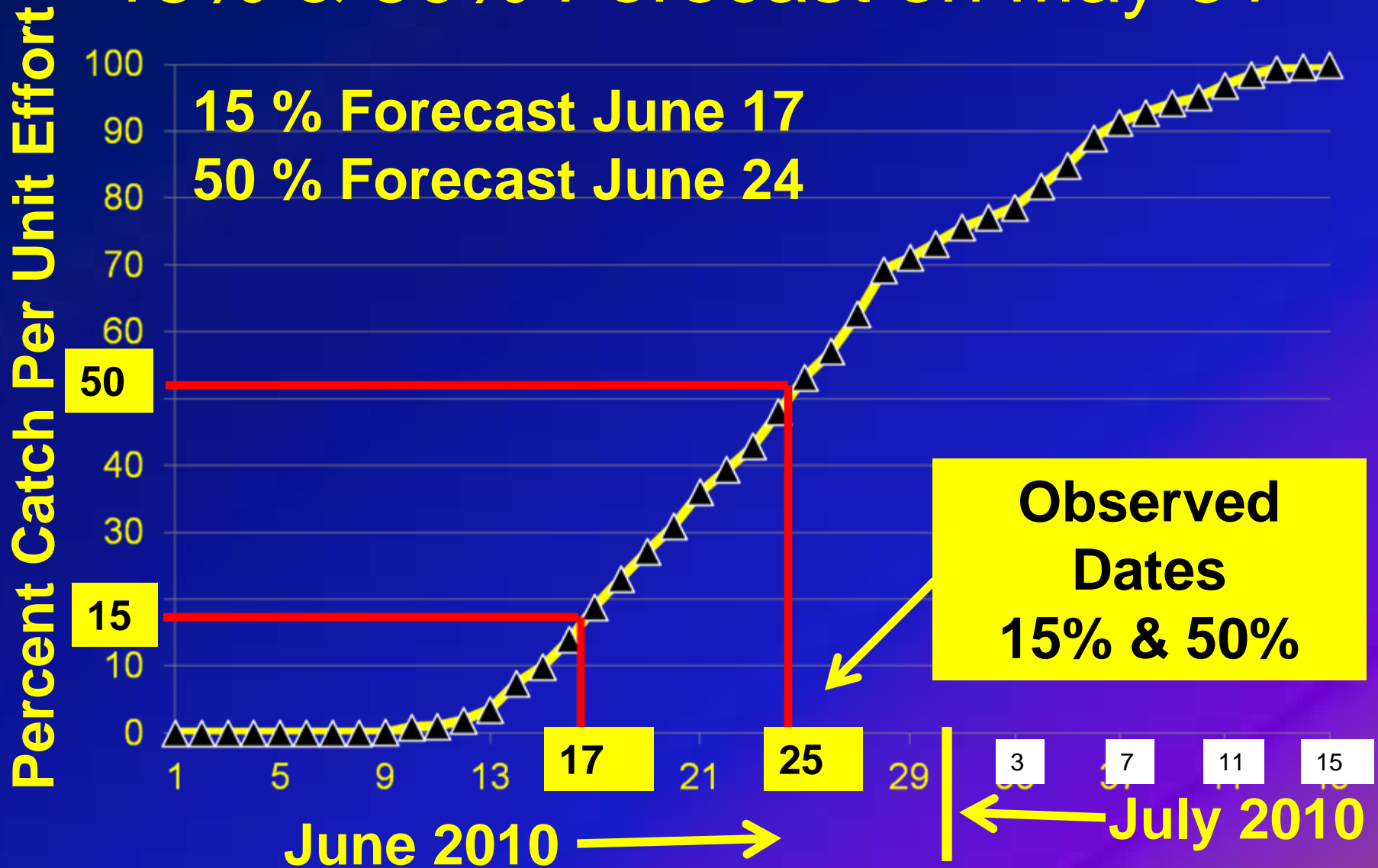
$$\text{Model Timing} = (-0.410)\text{AIRT} + (-1.638)\text{SST} + 17.357$$

## Observed Timing 1961 - 2009



# 2010 Yukon Chinook Timing

## 15% & 50% Forecast on May 31





# Conclusions

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- Retain hypothesis: Timing of marine exit is linked to climate and weather through effects on the location and stability of temperature-salinity fronts at river's mouth.
- 2010 forecast successful
- Forecasting run-timing using environmental variables shows promise as a fisheries management tool



# Next Steps

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- Add local air temperature data from Emmonak, AK
- Experiment with adding wind speed and wind direction and other marine variables, modeled and observed, such as density at depth
- Experiment with observations from different marine areas to explore concepts of marine distribution
- Longer term - Get some data on marine fish distribution with Alaska's new ice breaking research vessel