

*Science, Service, Stewardship*



## **Evaluating long-term climate predictions for the Bering Sea ecosystem using a suite of modeling approaches**

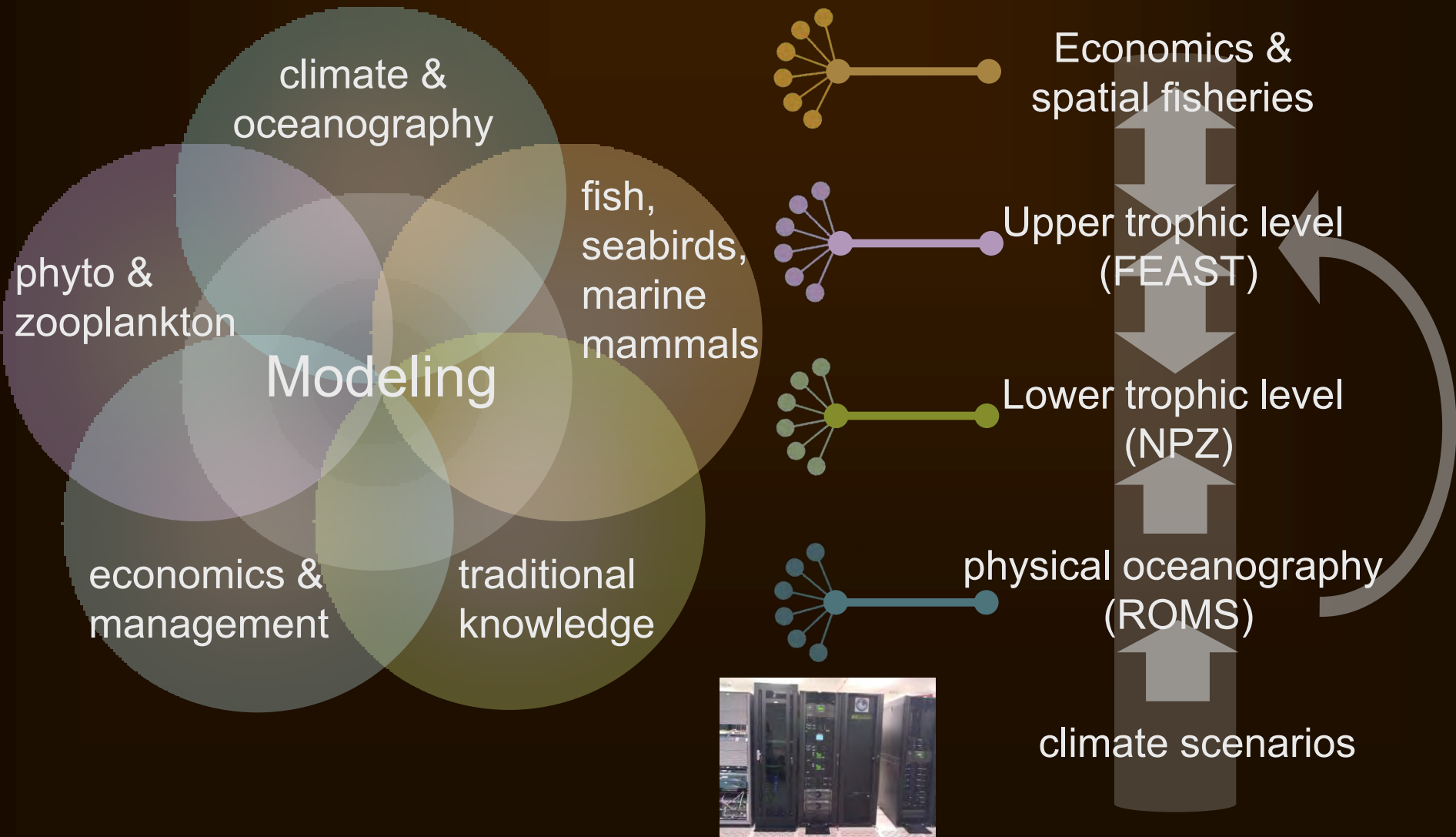
Kerim Aydin, Ivonne Ortiz, Albert J. Hermann,  
Georgina A. Gibson and André E. Punt

**NOAA  
FISHERIES  
SERVICE**



# The Bering Sea Project

## BEST/BSIERP Research Program



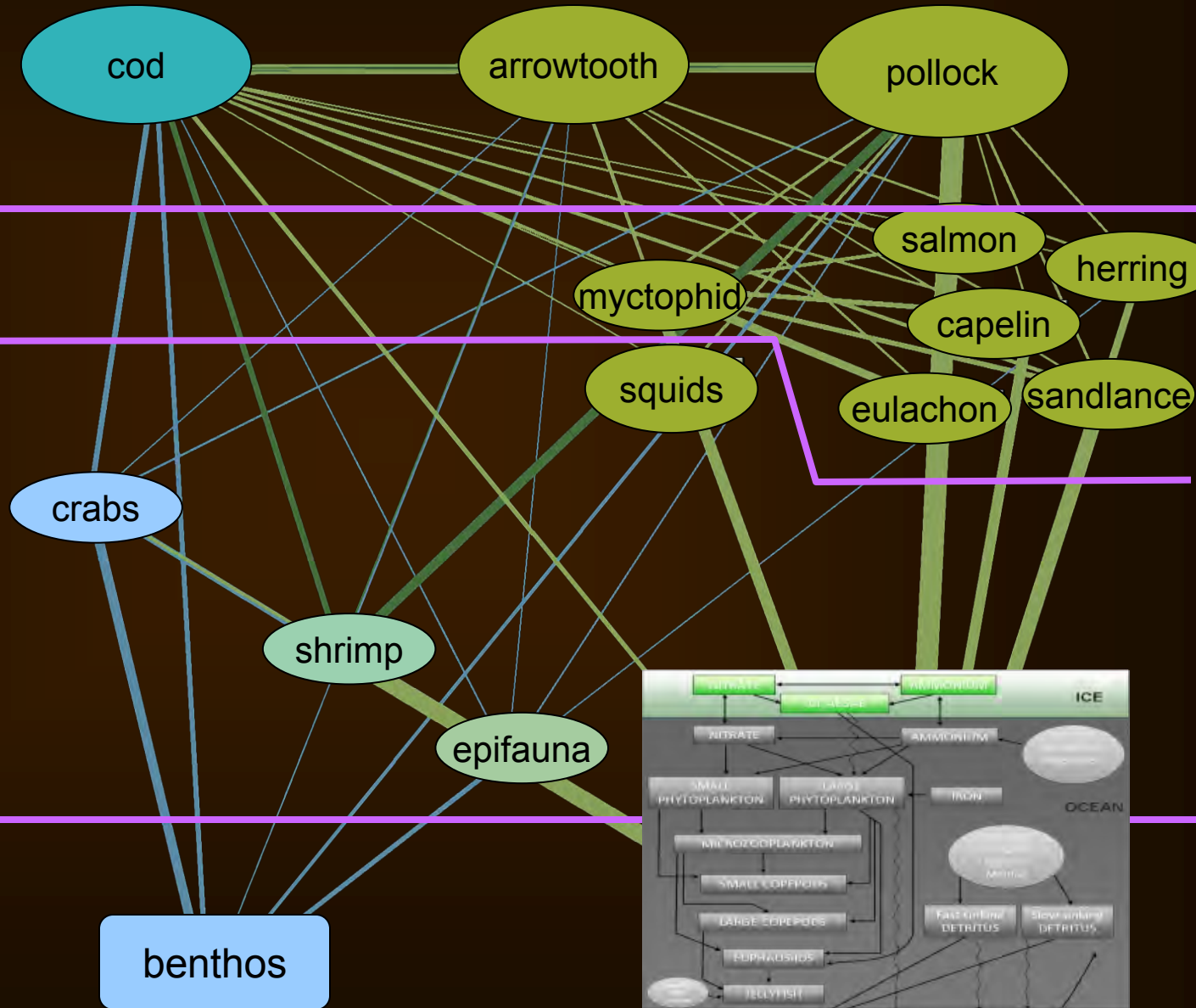
# FEAST – built within 10km<sup>2</sup> ROMS

11 ages/ 15 lengths  
high detail

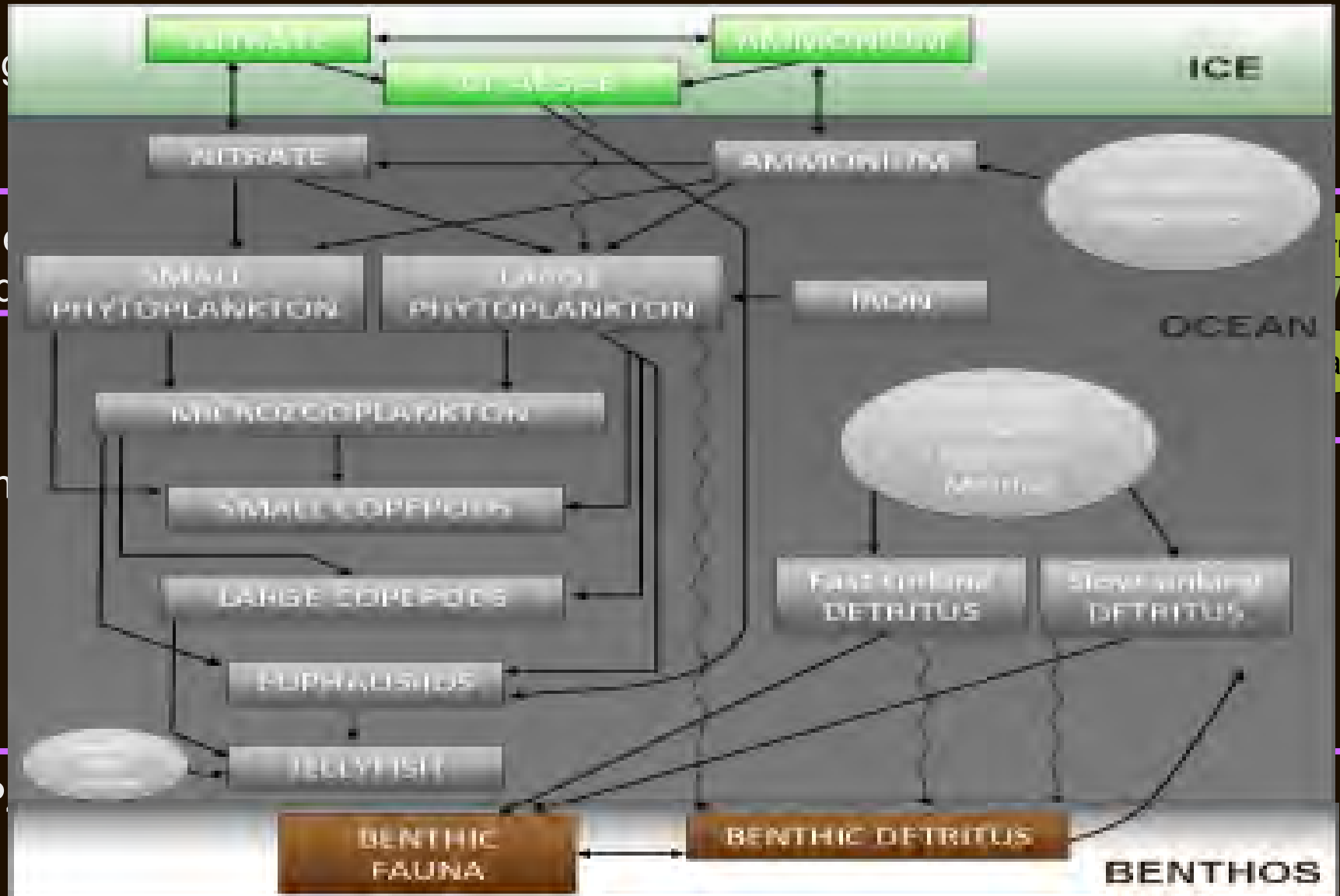
15 lengths  
medium detail

biomass pools  
low detail

NPZ



# FEAST

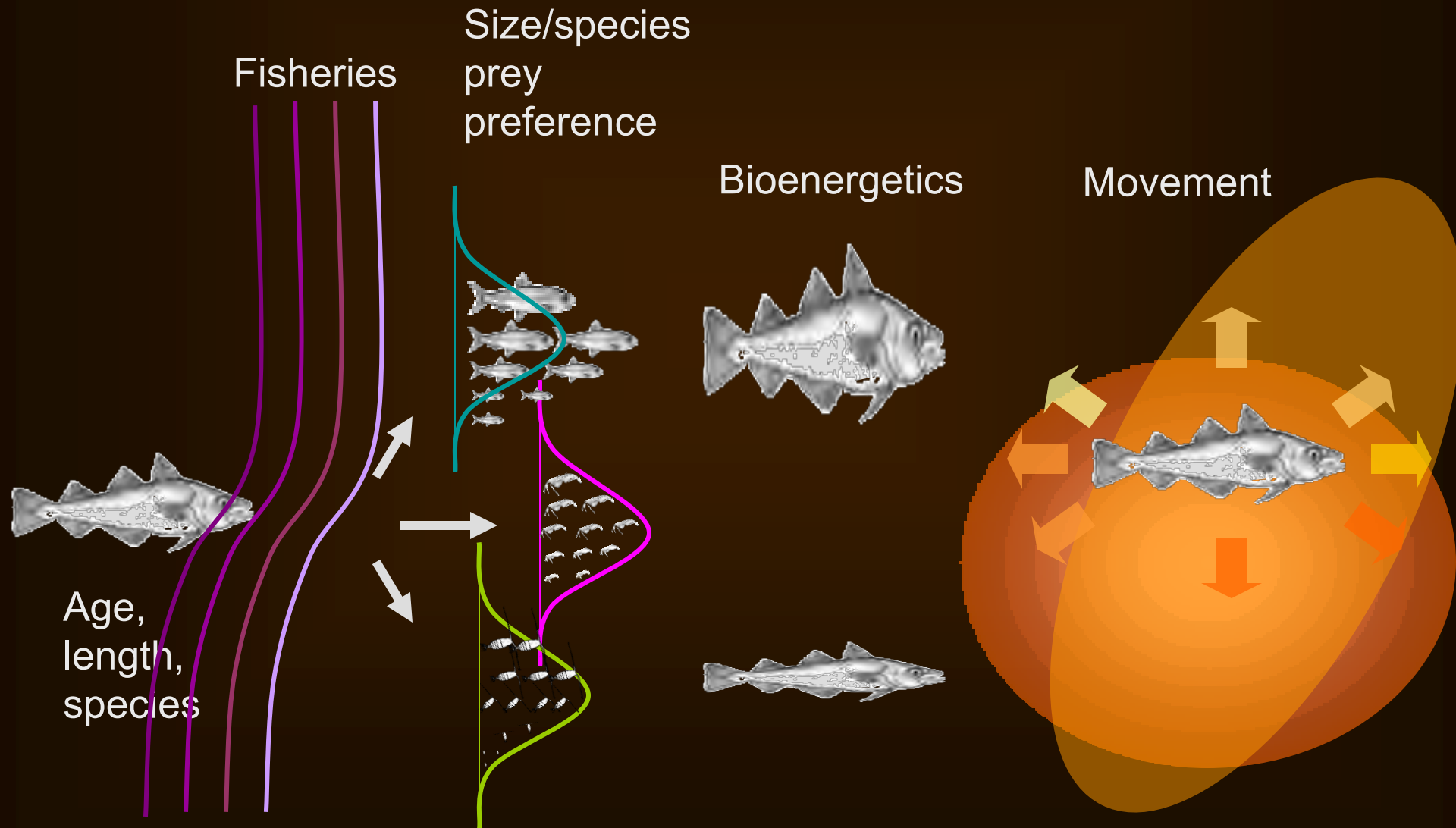


euphausiids

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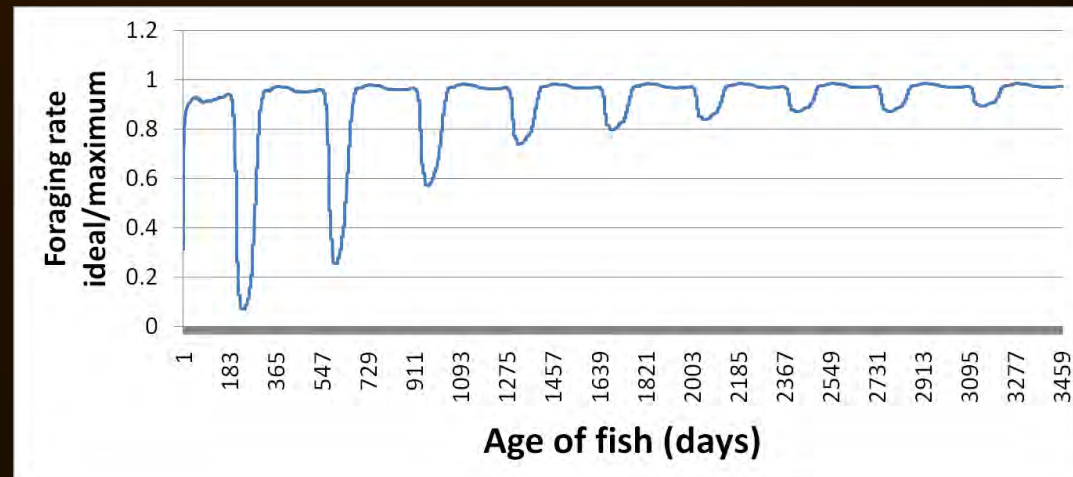
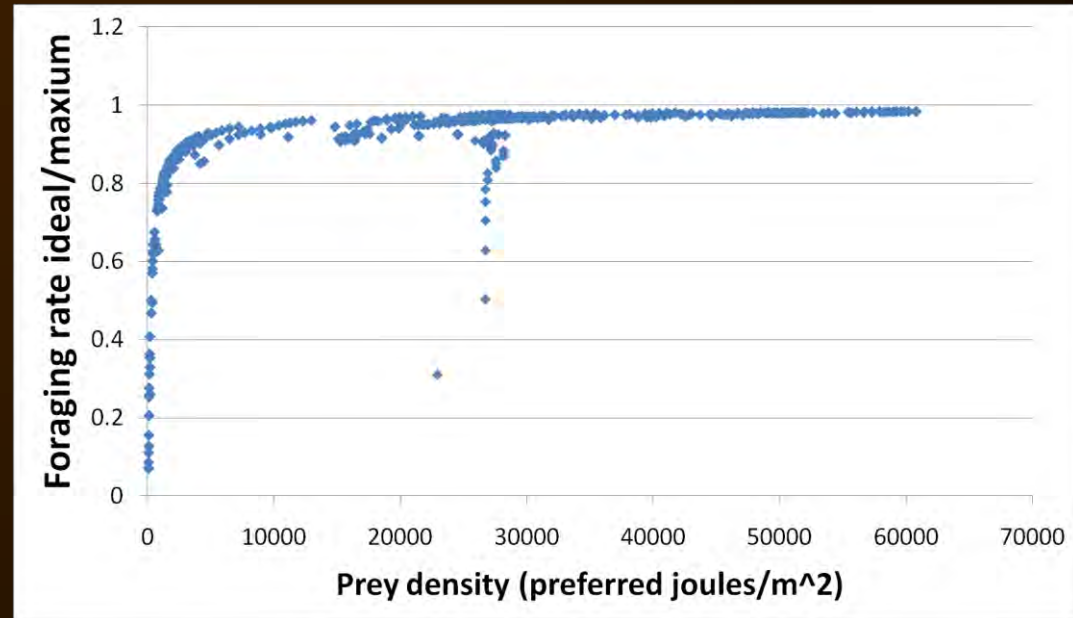
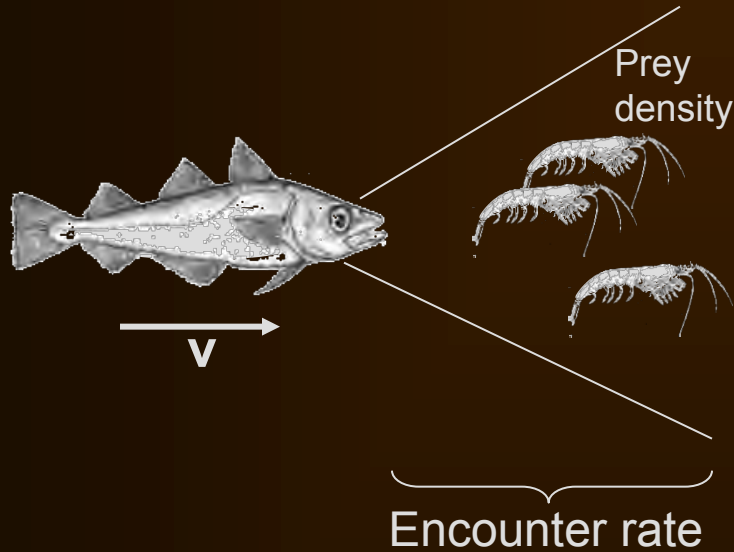
ring  
ance

# FEAST





# Linking foraging and bioenergetics into functional responses

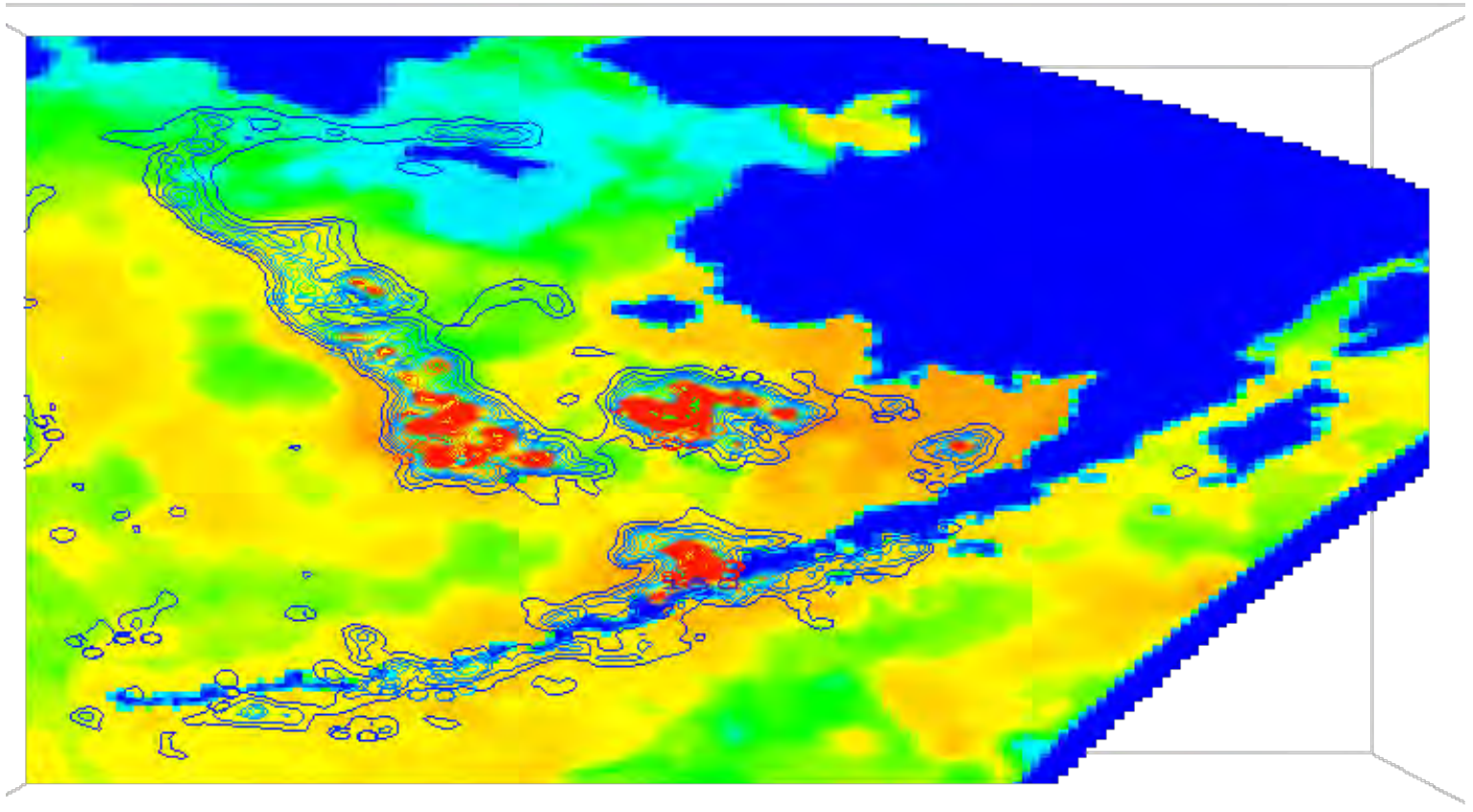


Useful consumption (joules) =  $f(V, T, L)$

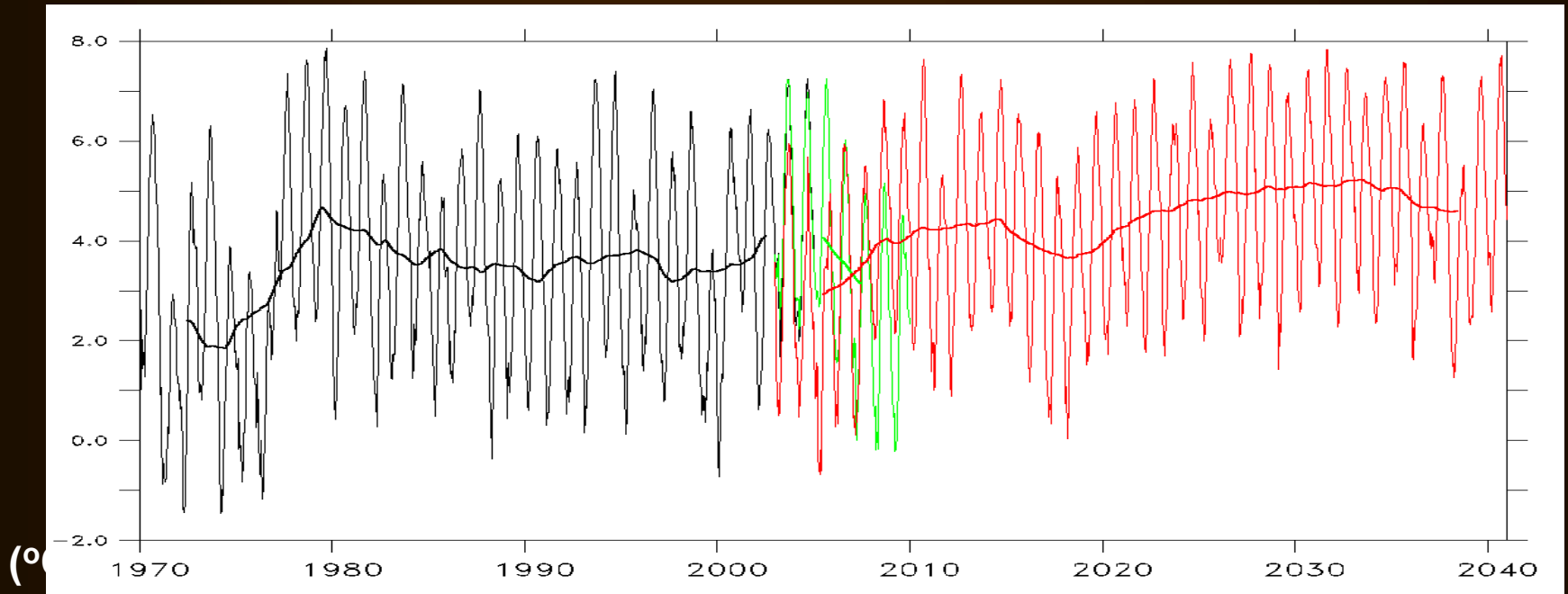
Respiration (joules) =  $A_v V^{B_v} * f_r(T)$

## Pollock and euphausiid densities

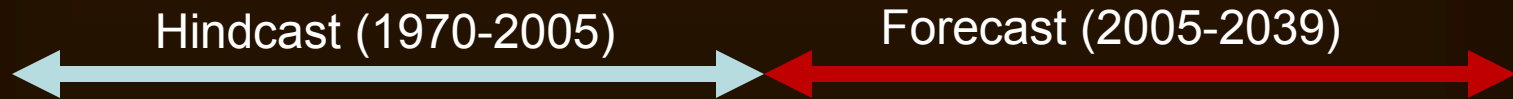
Modeled age 5 pollock biomass (colored contours) and 0-300m integrated euphausiid density (color field) for July, 2004. The location of primary pollock concentrations along the northwest shelf break and in the Unimak Pass area shows a strong correspondence with historical distributions.



# Results Examined



## Original plan

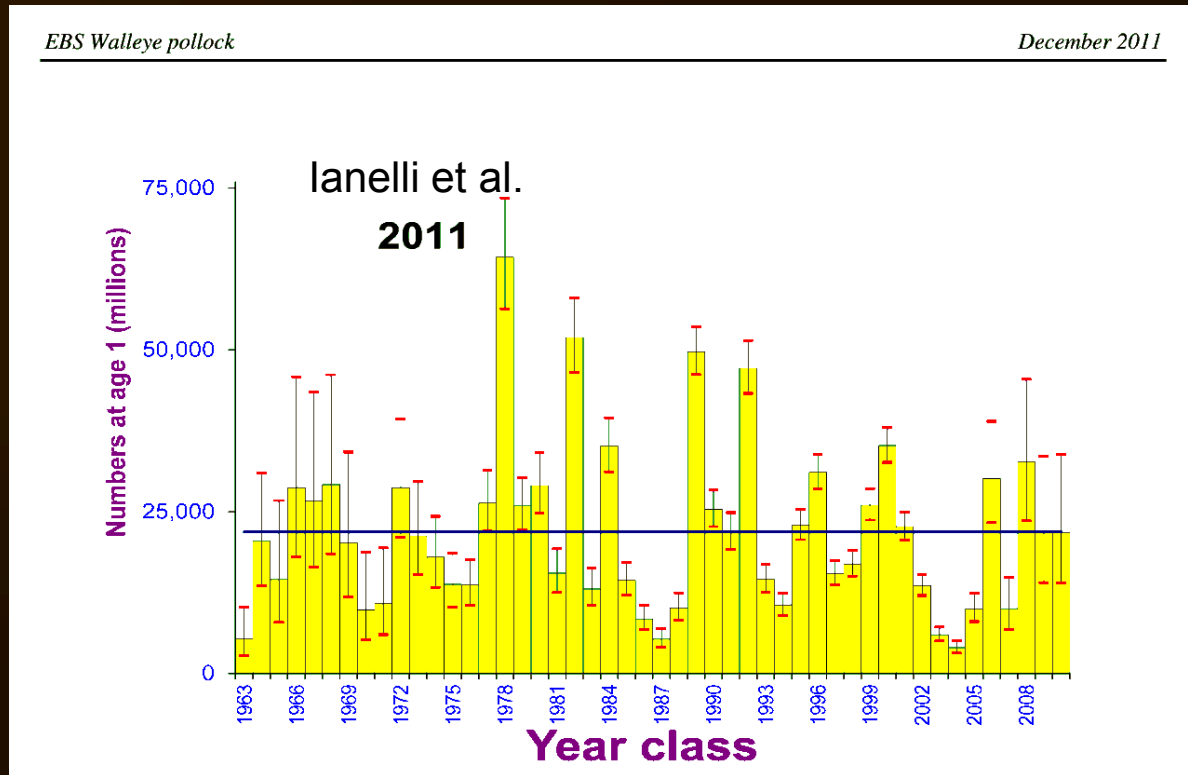
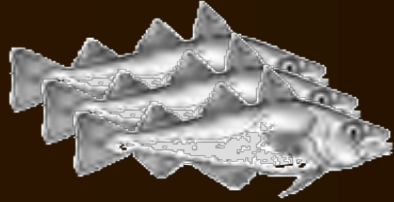


## Realized results



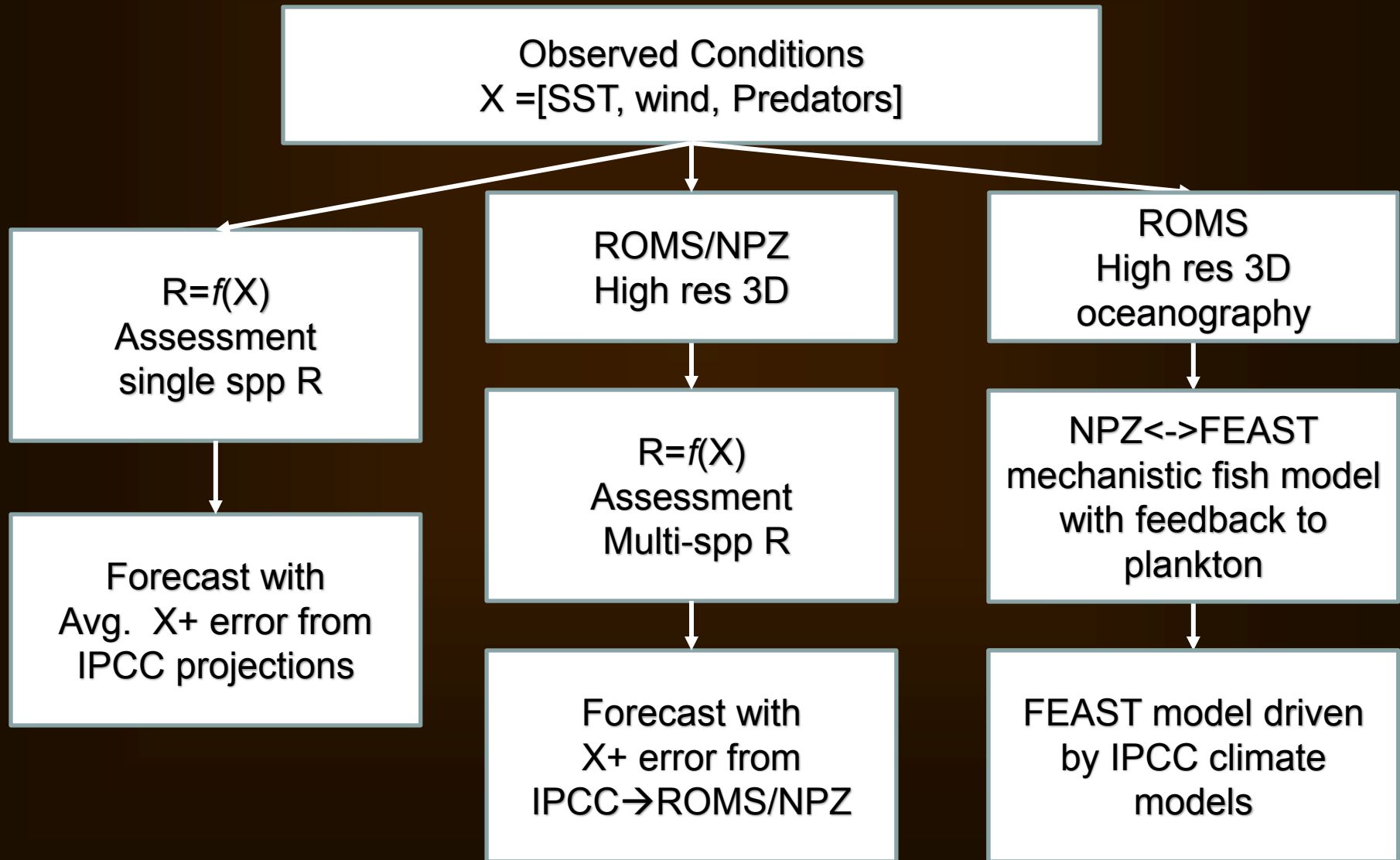


# Results here focus on walleye pollock

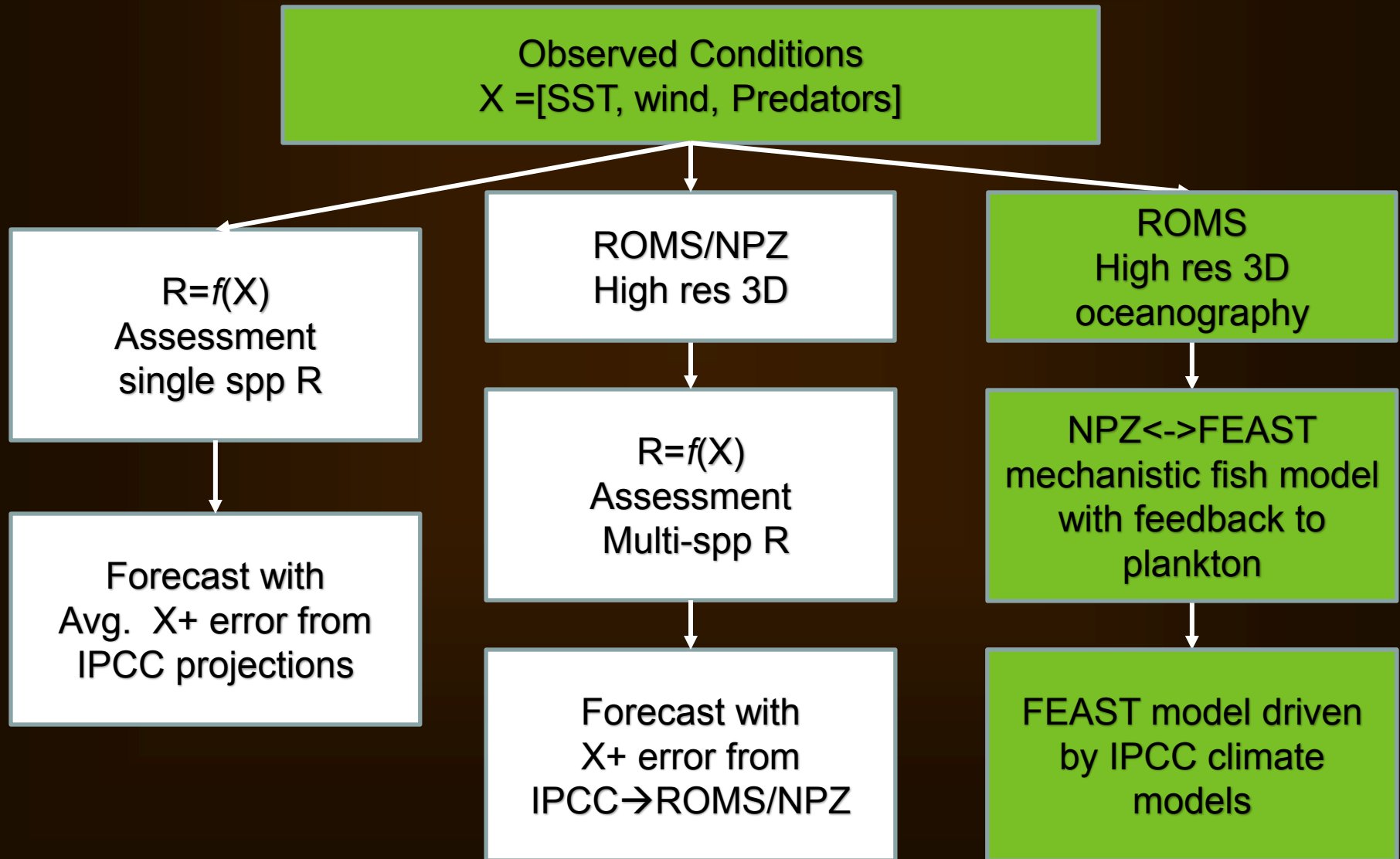


*Stock assessment estimate of Bering Sea walleye pollock recruitment*

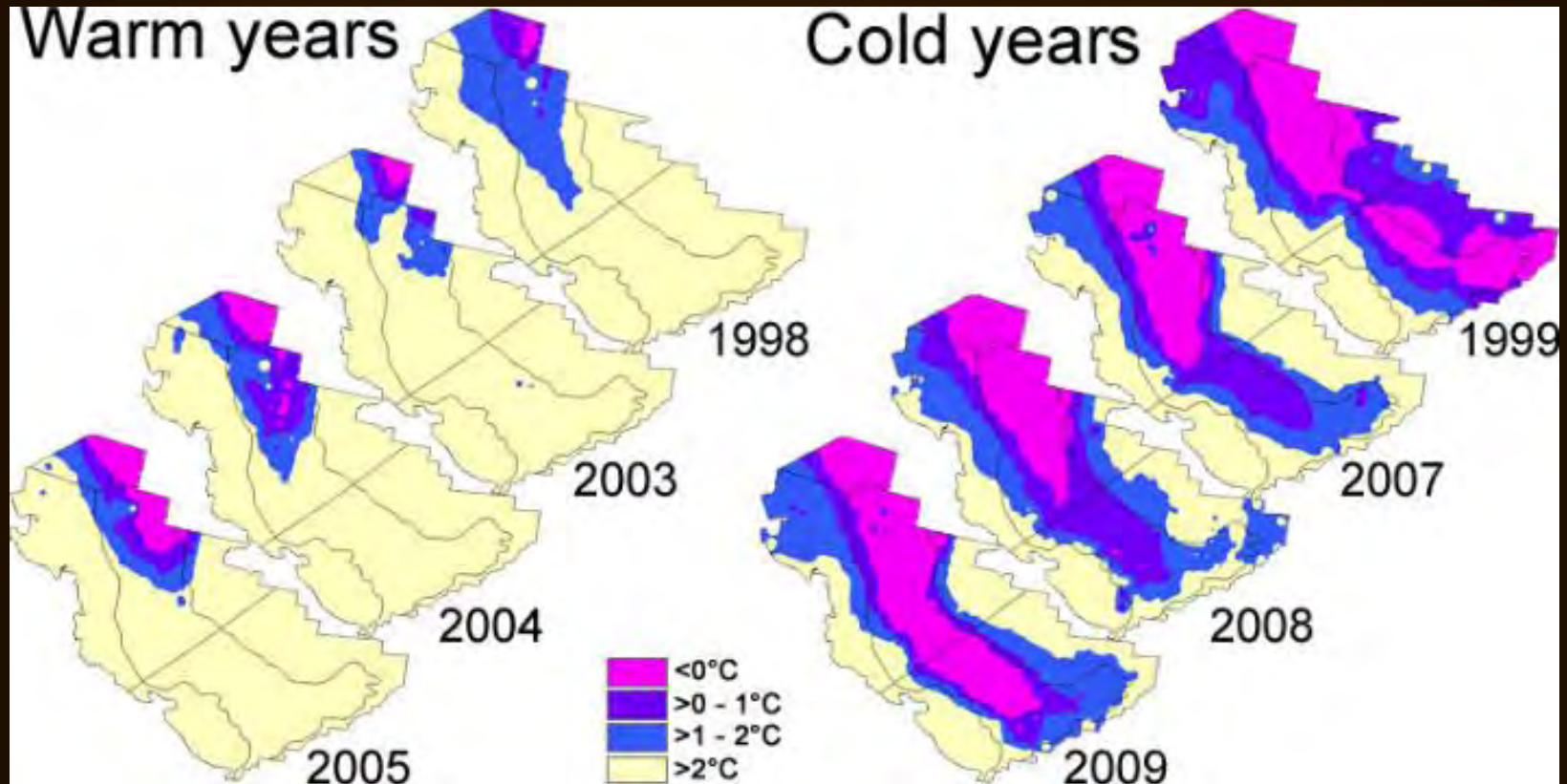
# “Competing” methods for forecasting future conditions



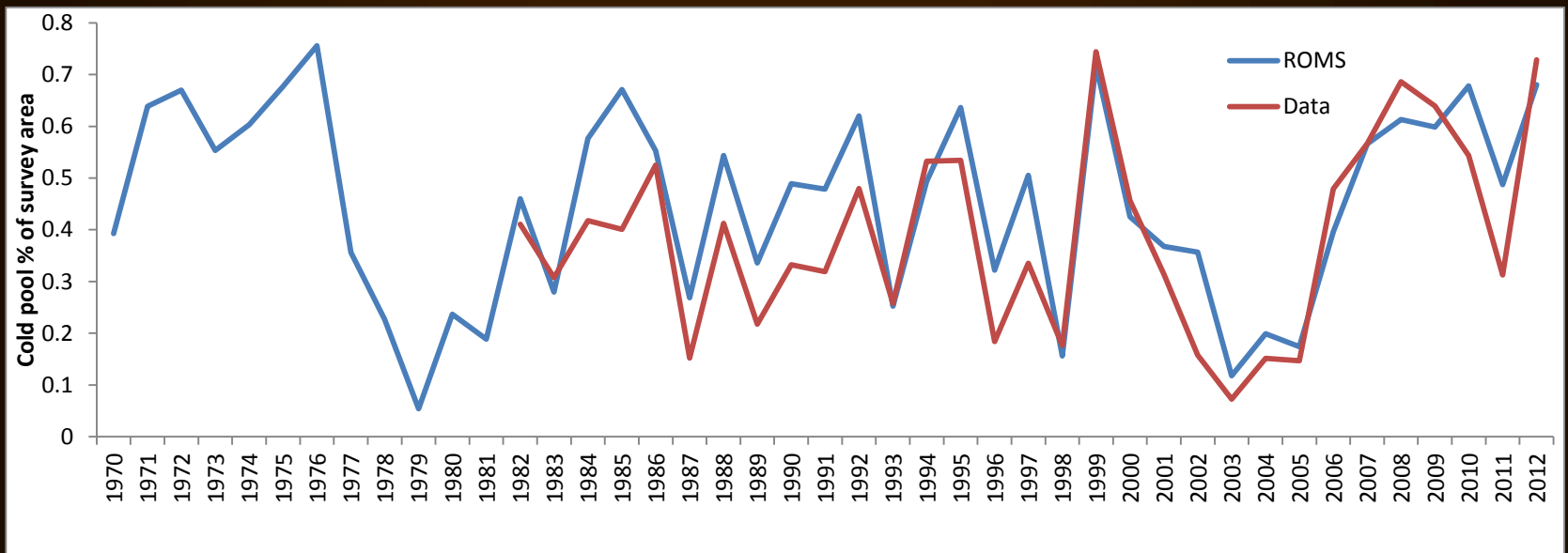
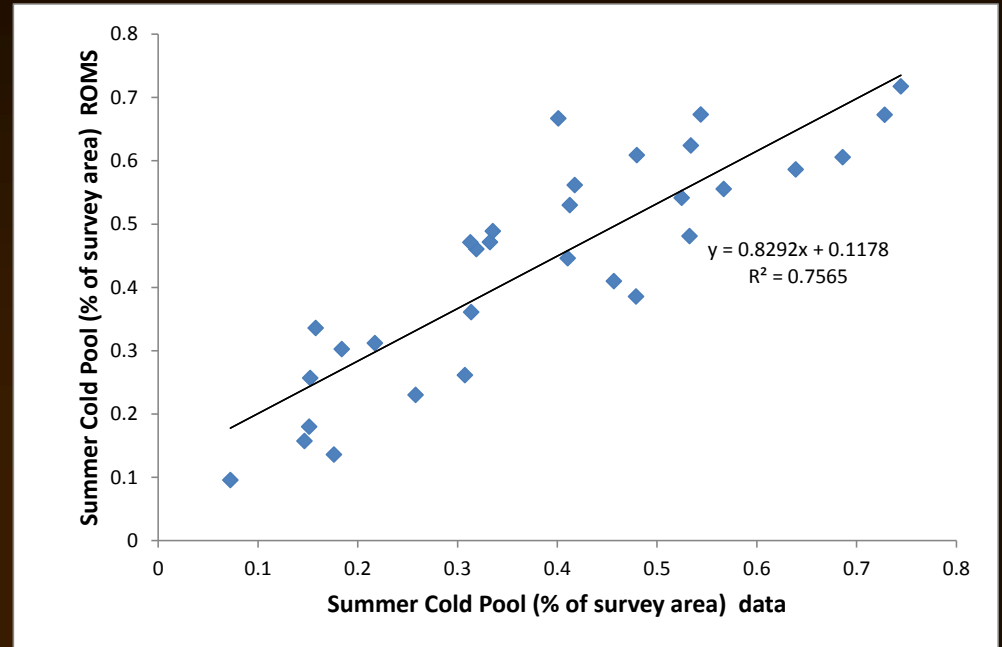
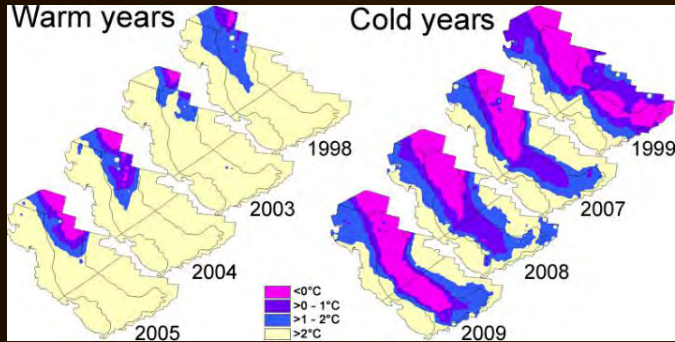
# “Competing” methods for forecasting future conditions



Focus of physical predictions is on dynamic habitat variables

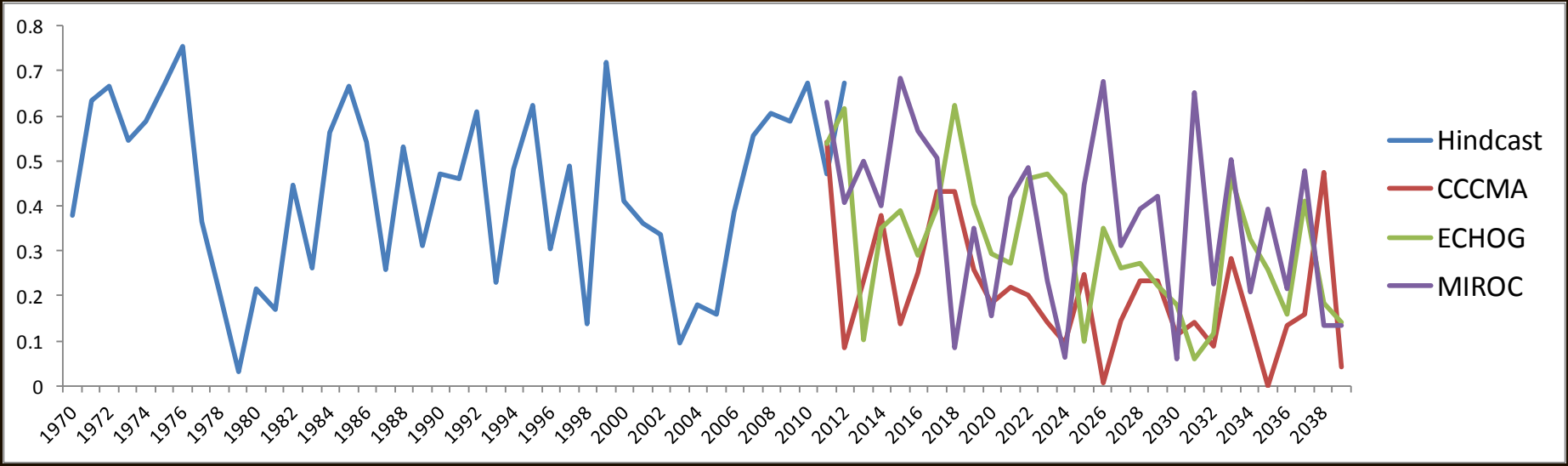
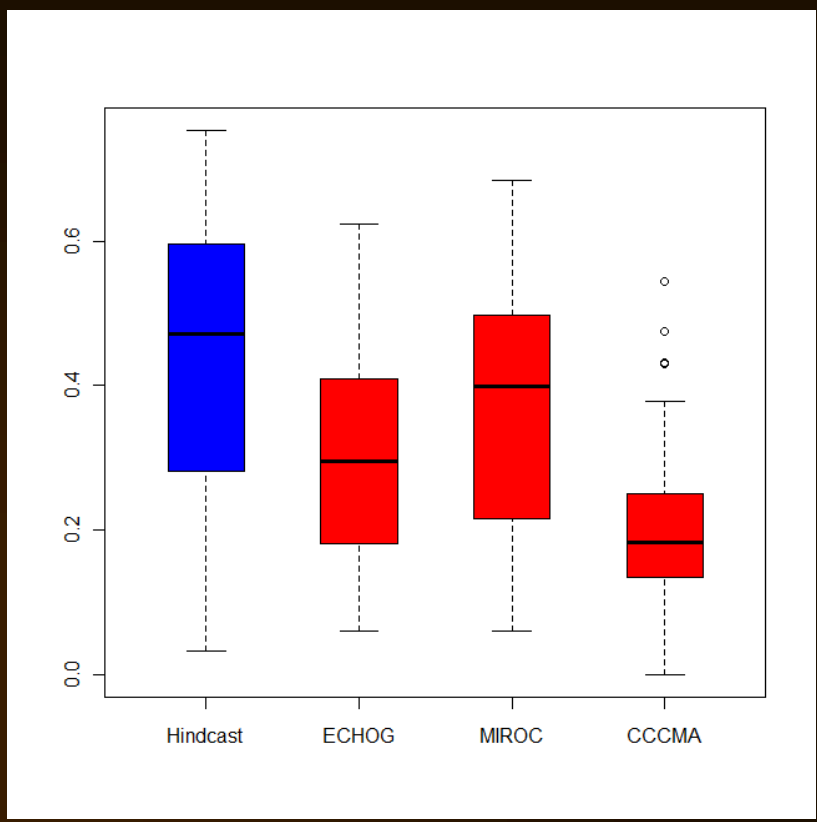
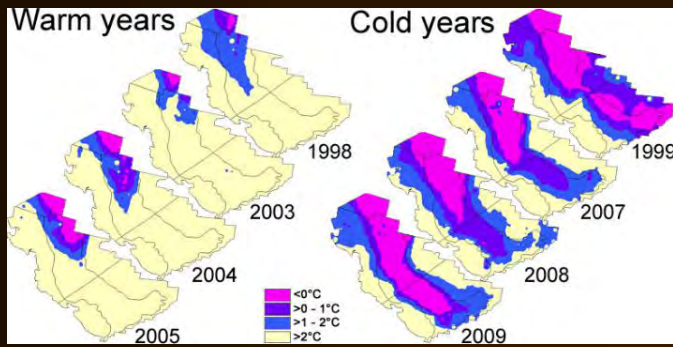


# Modeling of cold pool – hindcast versus data





# Modeling of cold pool – hindcast versus forecast

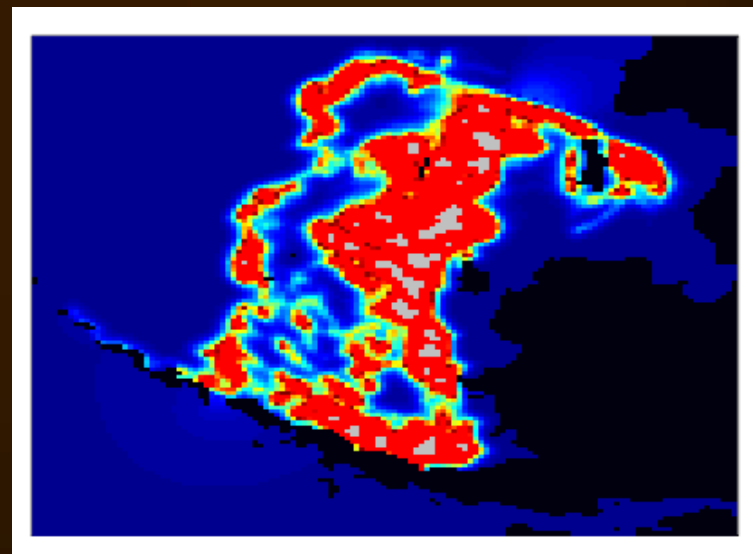
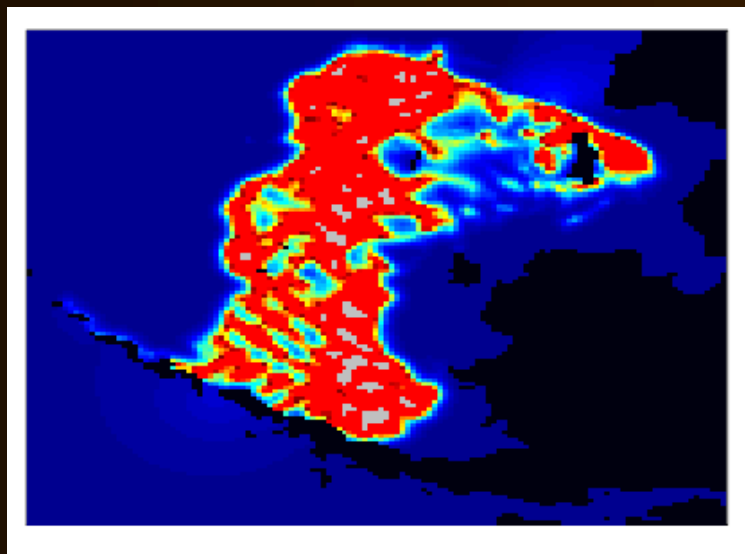


# Age 3+ pollock biomass distribution

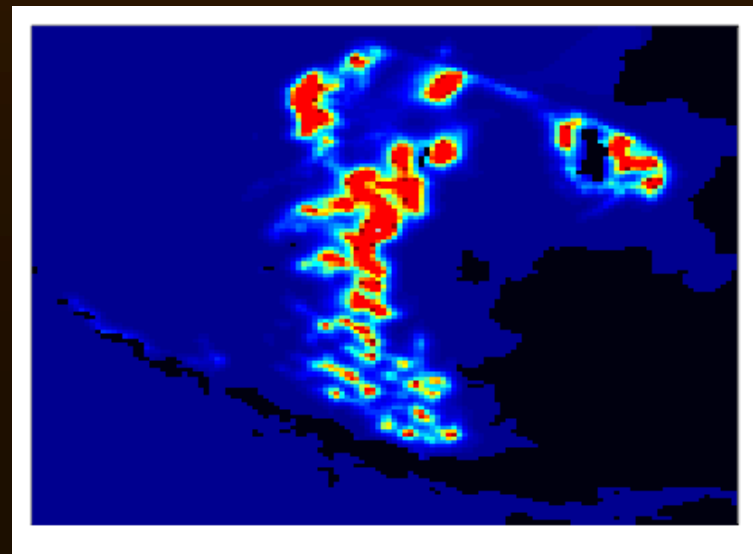
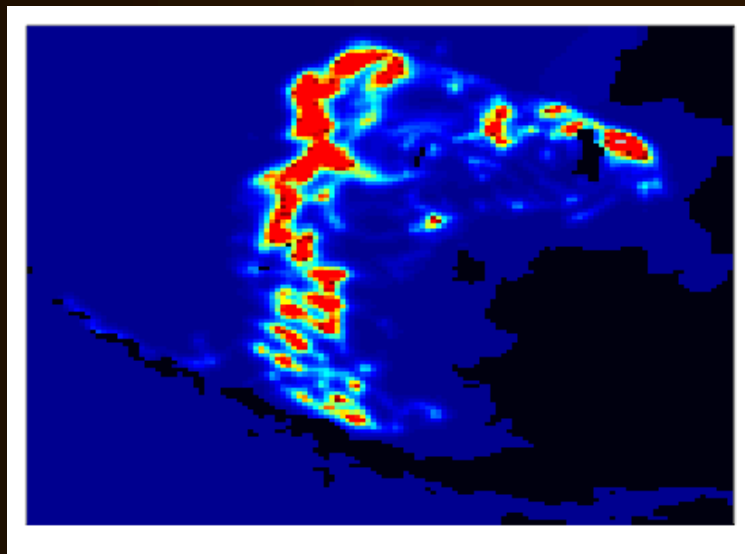
JULY 1

AUGUST 15

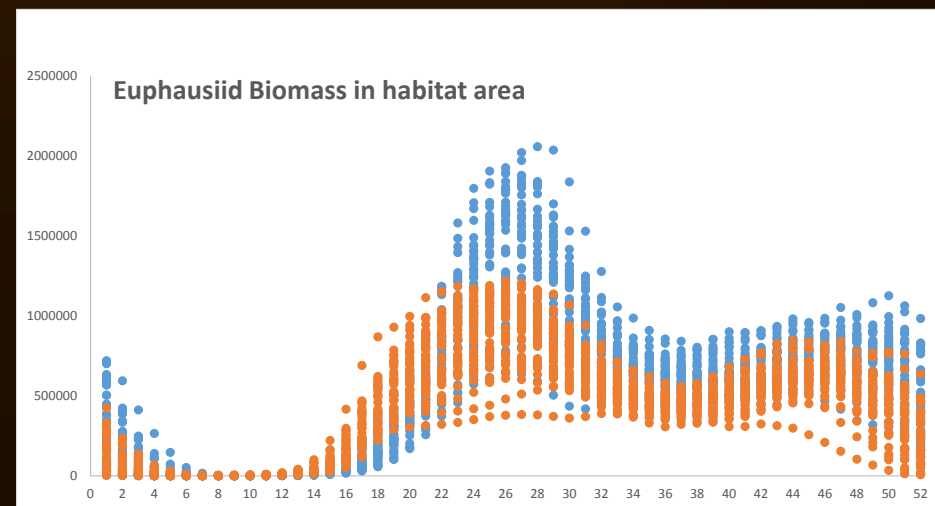
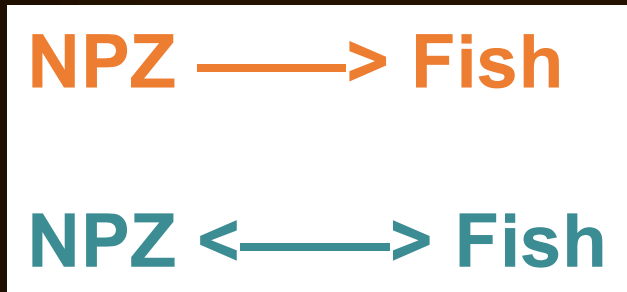
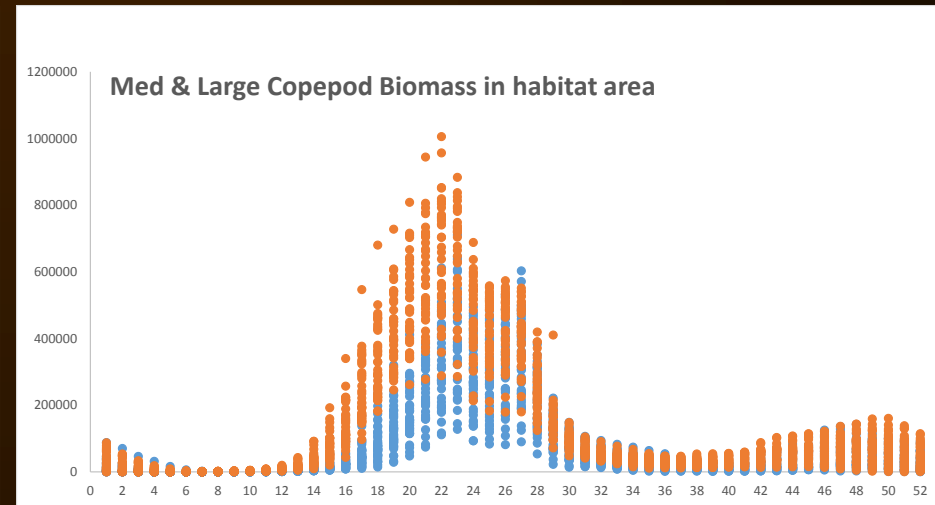
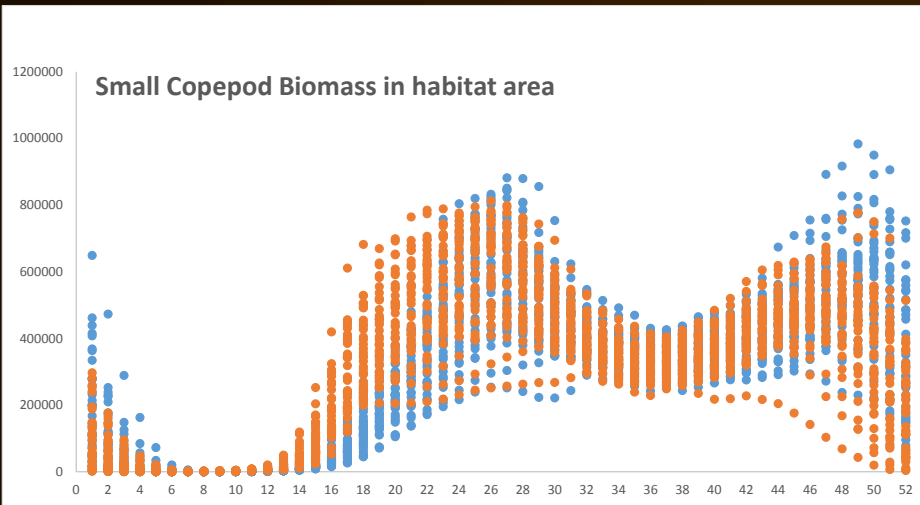
2004  
(HOT)



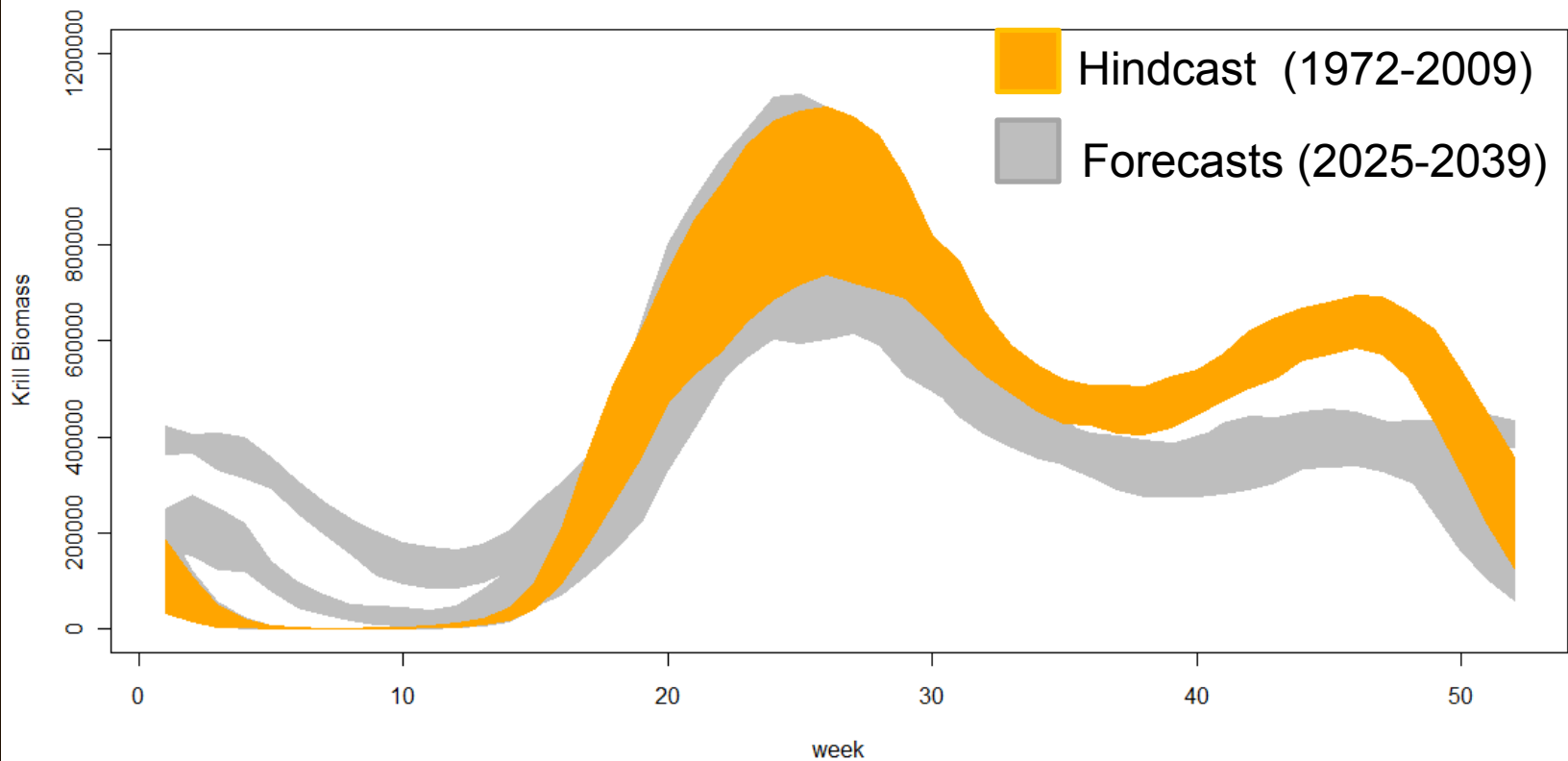
2008  
(COLD)

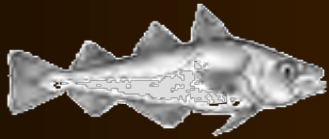


# Seasonal cycle: coupled versus uncoupled

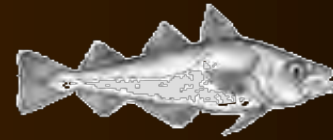


# Seasonal cycle: hindcast vs. forecasts





# Take-home



- For future Bering Sea pollock prediction, fall (Sep-Nov) may be where the action is.
- Fall is a poorly understood time of year.
- Total annual production (dominated by spring blooms) is not expected to be the critical bottleneck, this is important when looking at global model predictions.
- Coupled forecasts, when complete, are likely to show more rapid grazing down, may emphasize/increase fall effects.