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**The FEAST model for the Bering Sea**  
Forage and  
Euphausiid  
Abundance in  
Space and  
Time

Kerim Aydin, Al Hermann, Ivonne Ortiz



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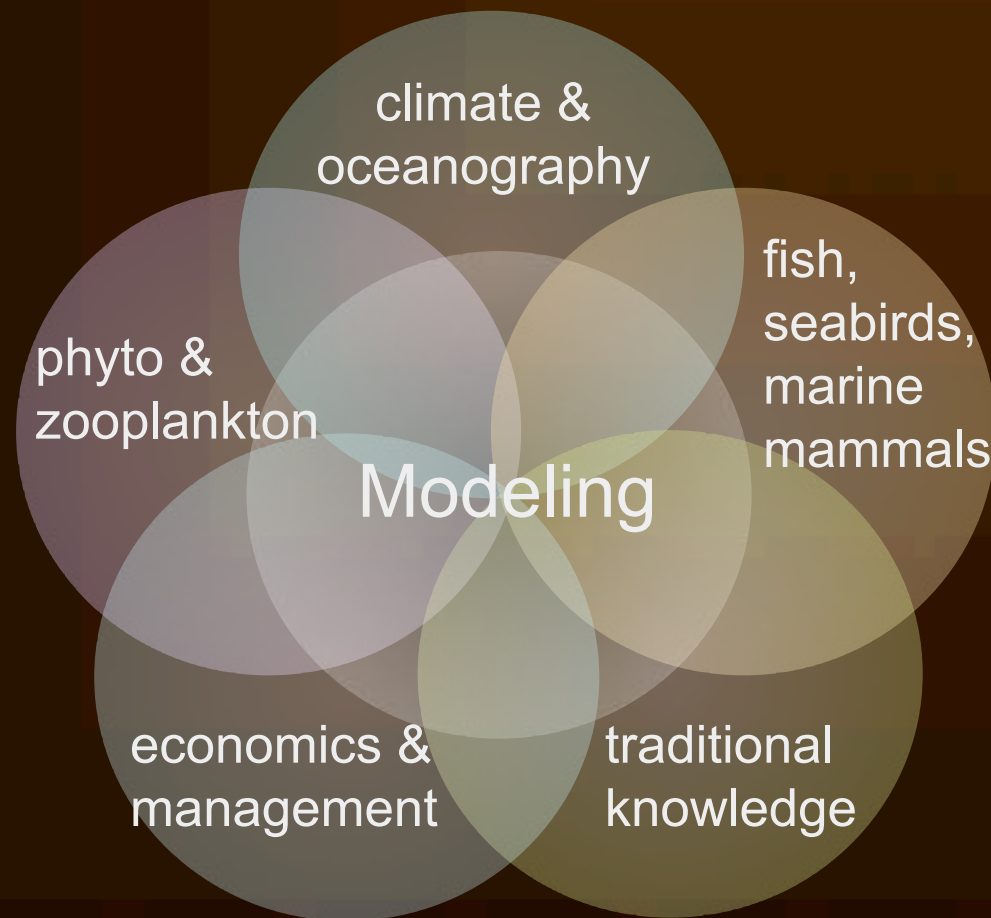
# The Bering Ecosystem Study/Bering Sea Integrated Research Program (BEST-BSIERP)

Kerim Aydin, Nick Bond, Charlotte Boyd, Enrique Curchitser, Michael Dalton, Georgina Gibson, Kate Hedstrom, Al Hermann, Liz Moffitt, James Murphy, Ivonne Ortiz, Andre Punt, Muyin Wang



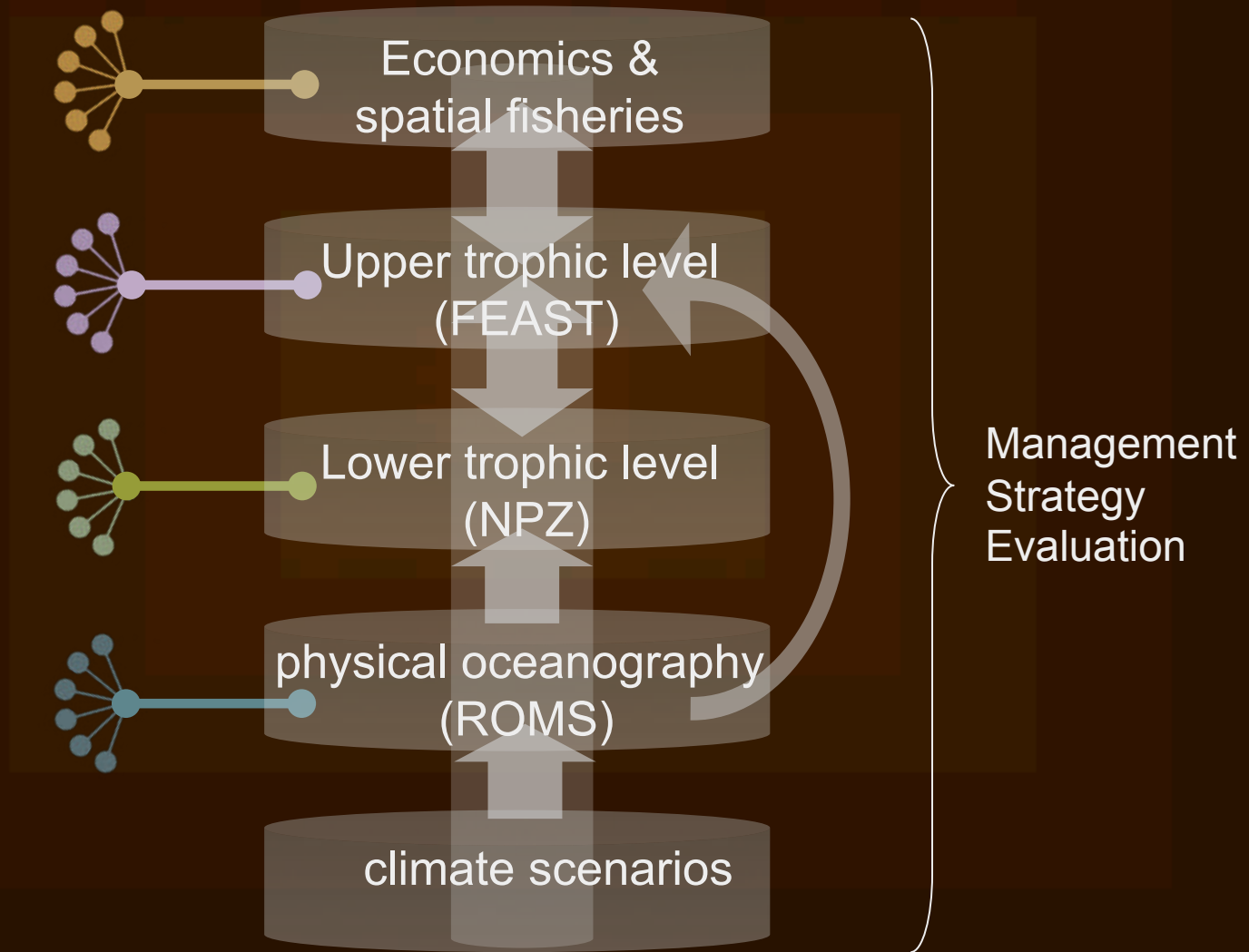
# *The Bering Sea Project*

## BEST/BSIERP Research Program



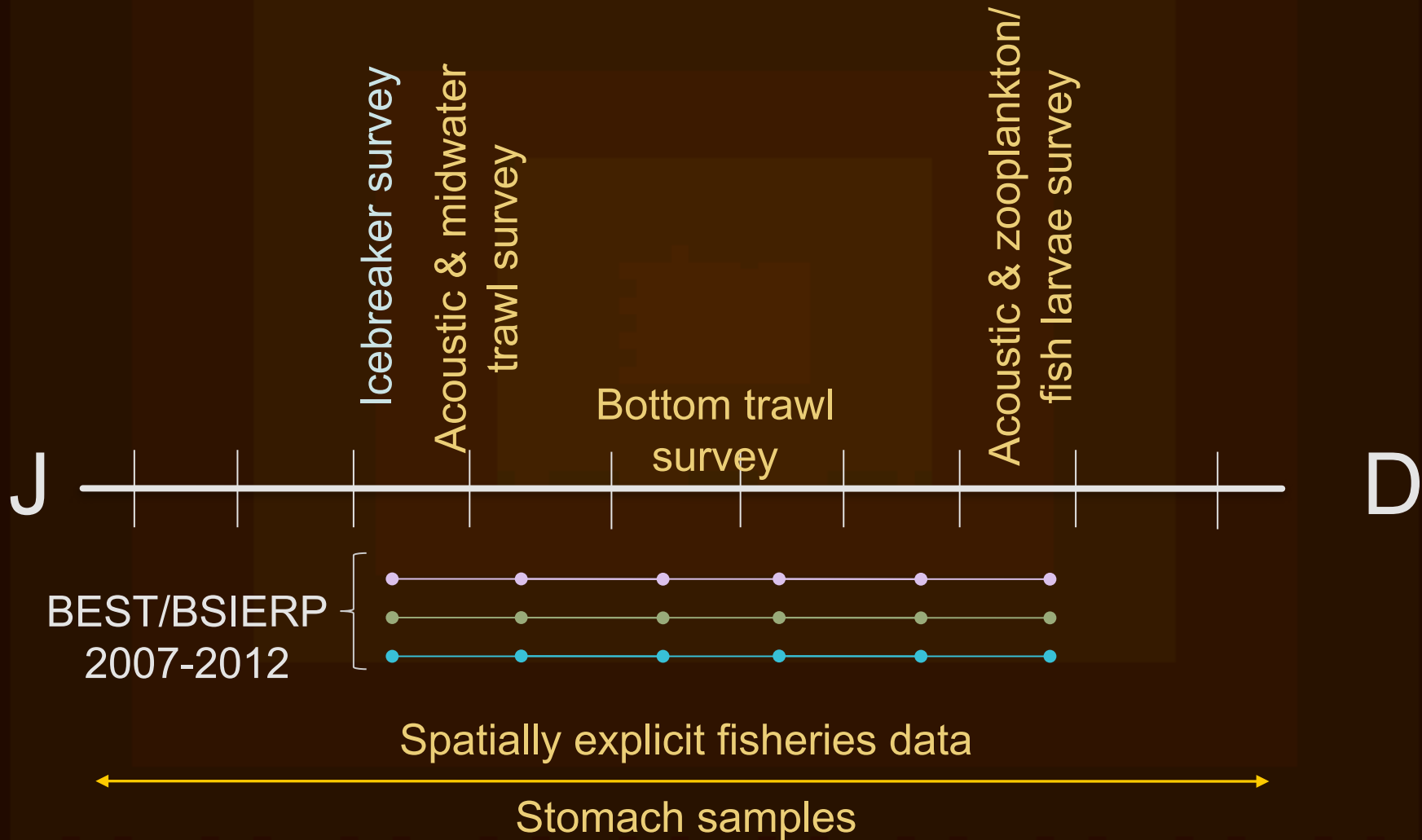
- 2007-2012
- 52 million USD
- ~35 linked projects
- 100+ researchers
- Joint field & modeling projects

# Vertically-integrated model

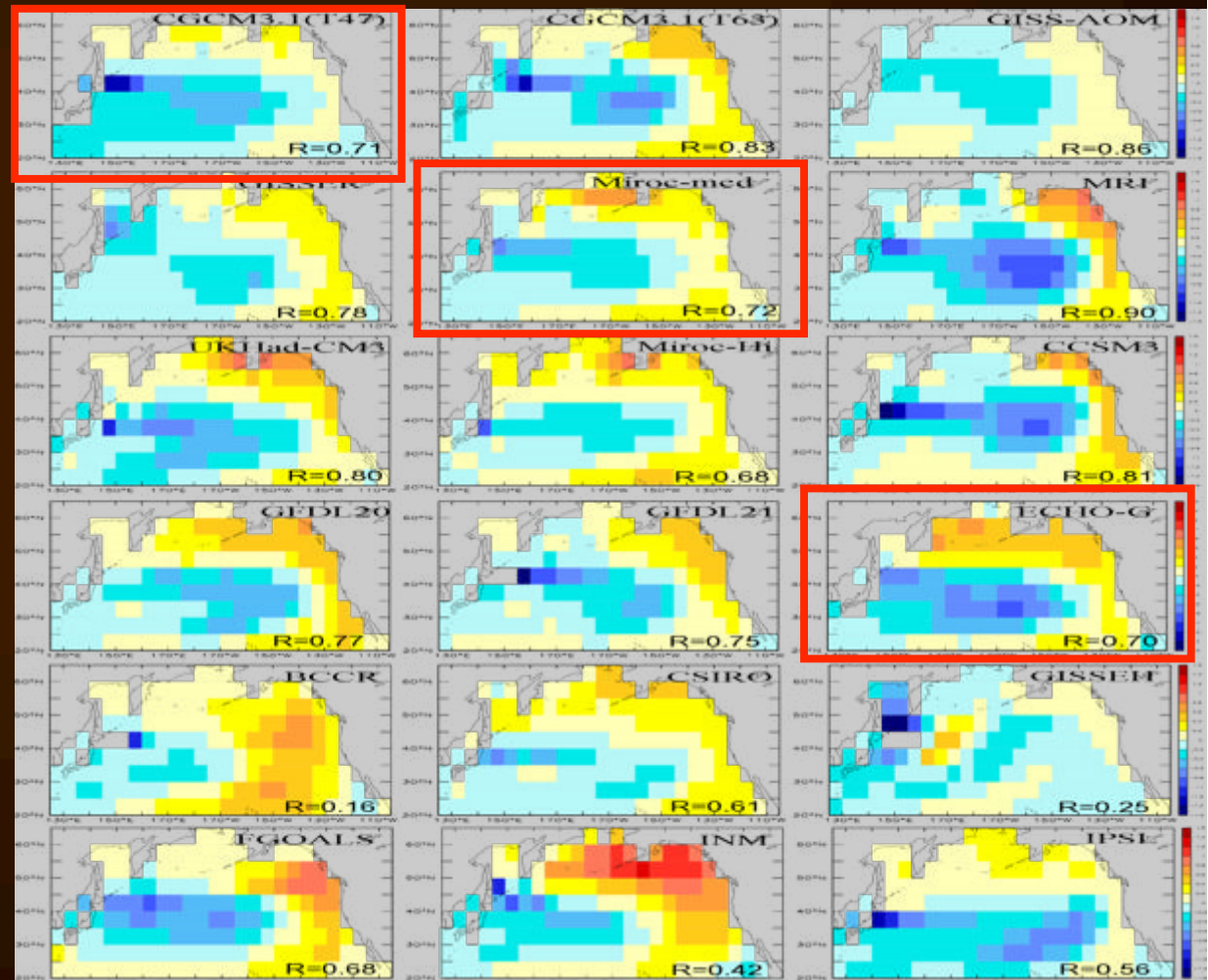


# Historical data & fieldwork

Time series available early 1960's - present



# Vertically-integrated model

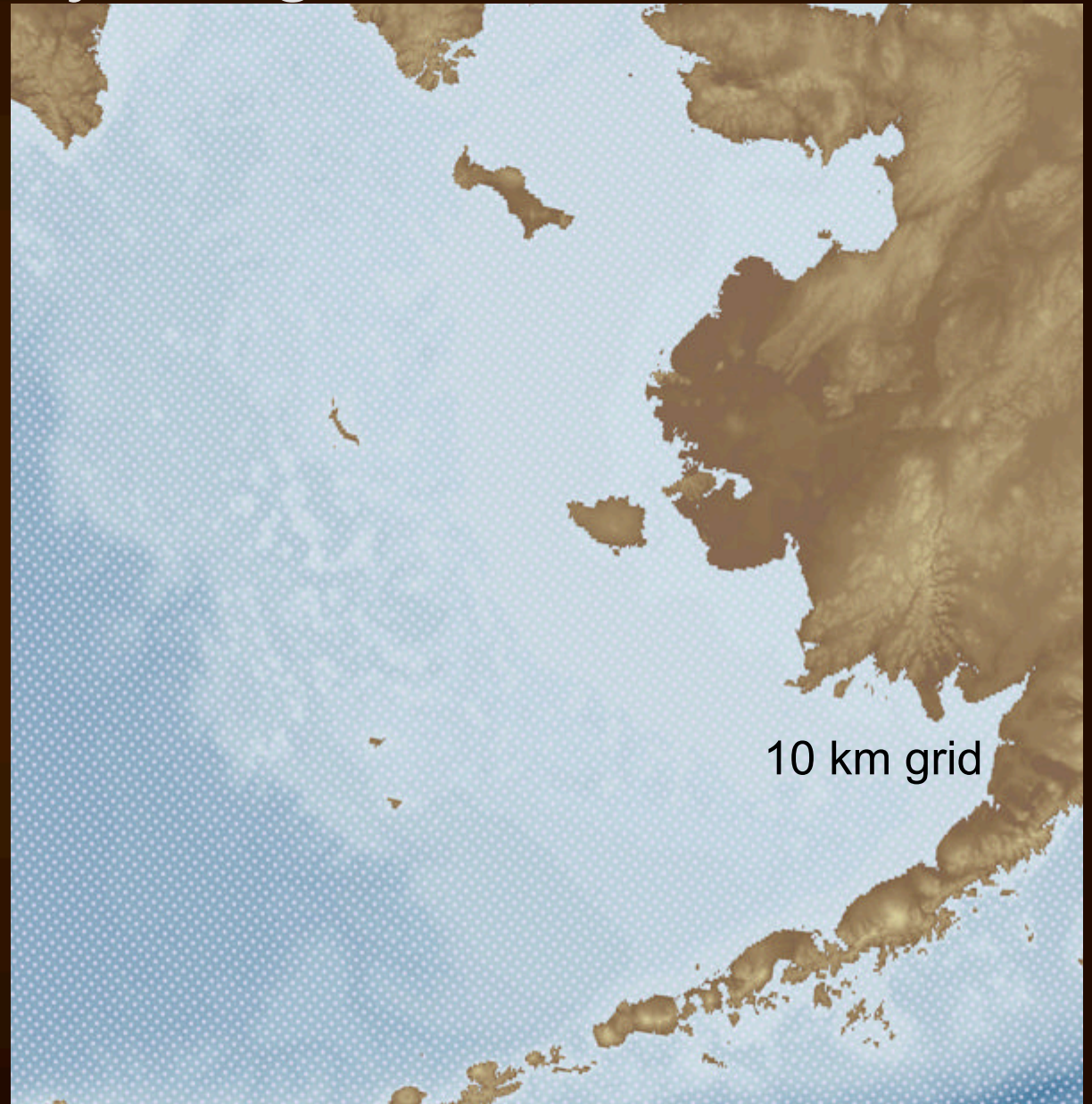


climate scenarios

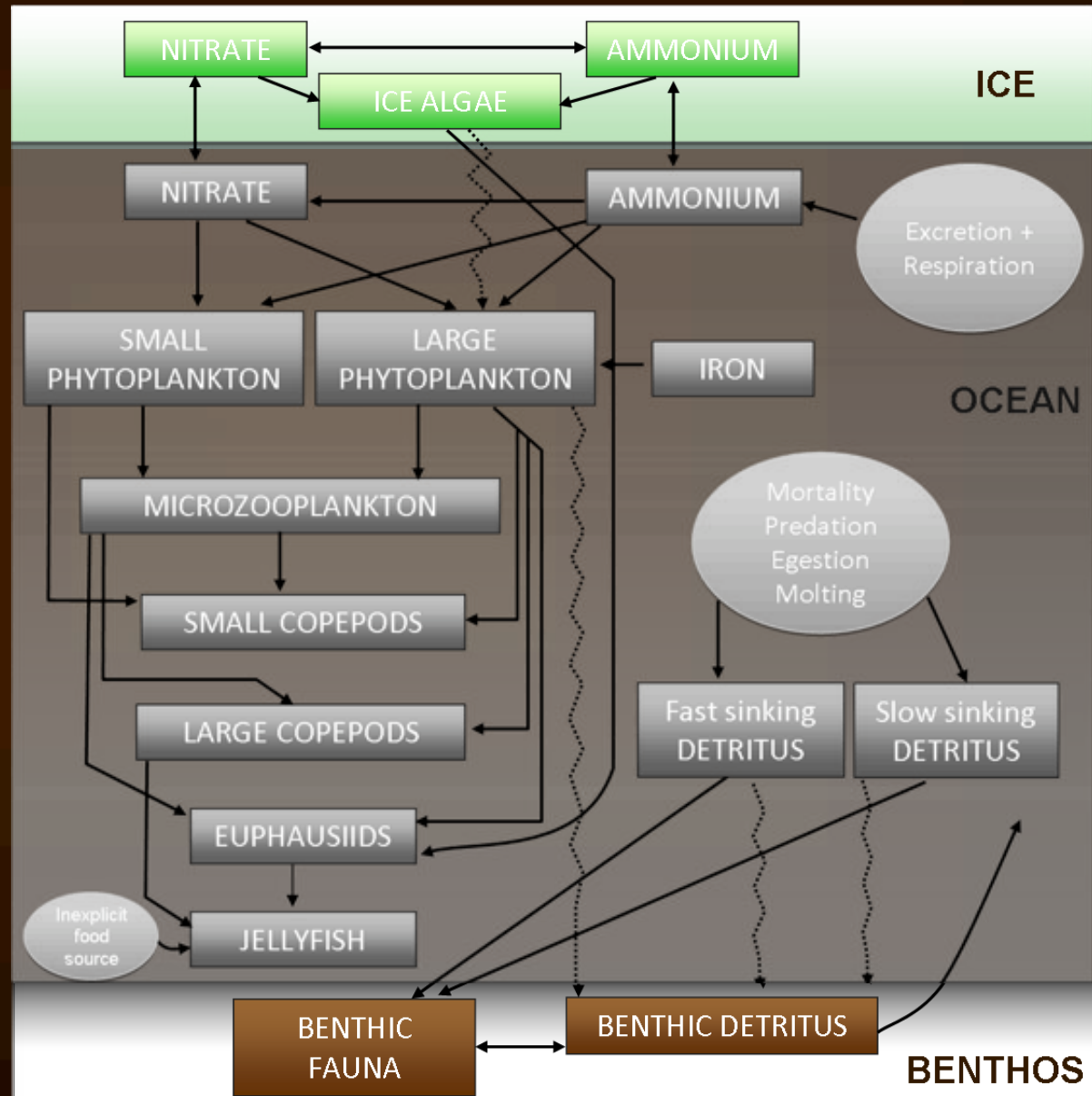
# Vertically-integrated model

physical oceanography  
(ROMS)

climate scenarios



# Vertically-integrated model



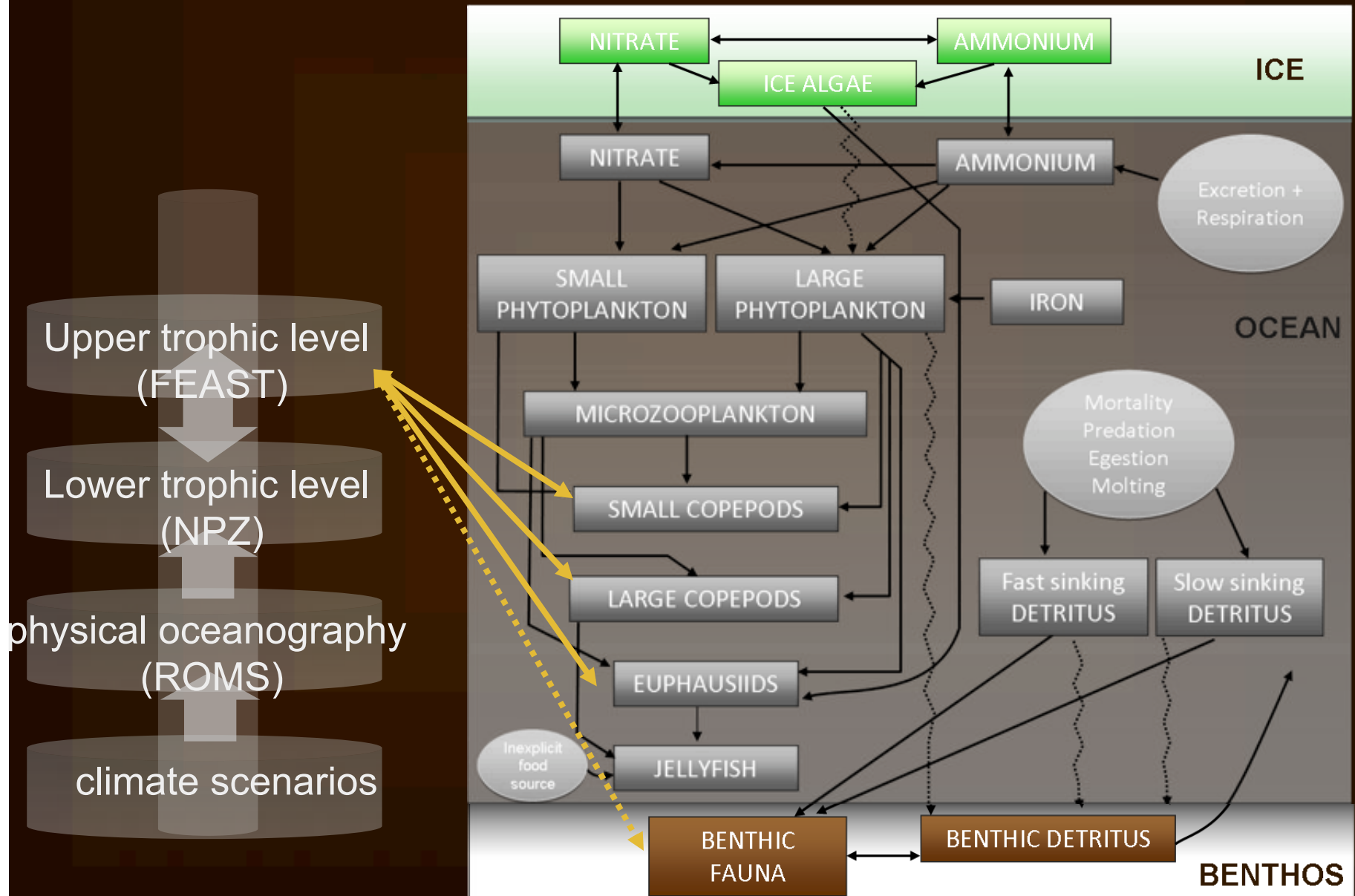
Lower trophic level (NPZ)

physical oceanography (ROMS)

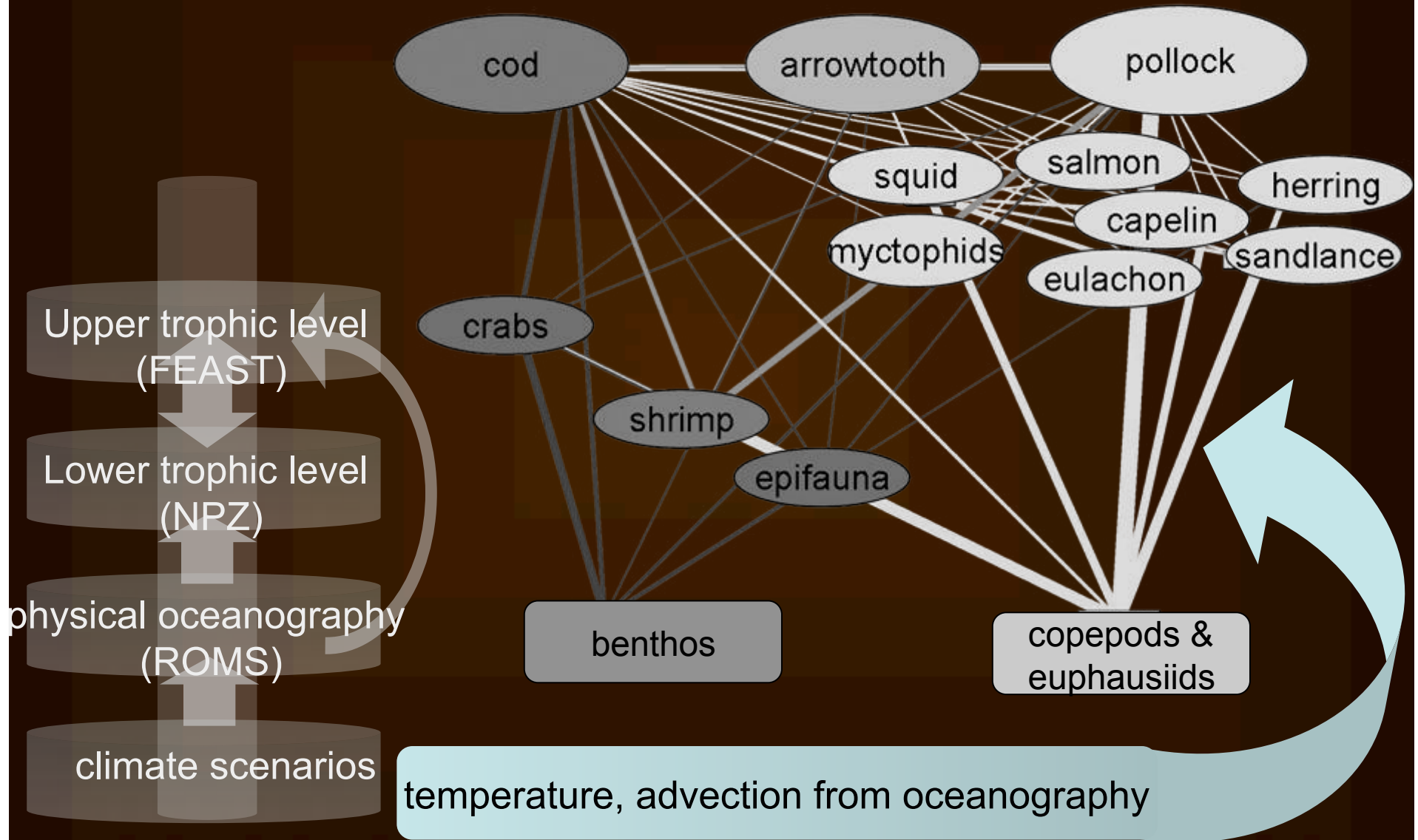
climate scenarios



# Vertically-integrated model



# Vertically-integrated model



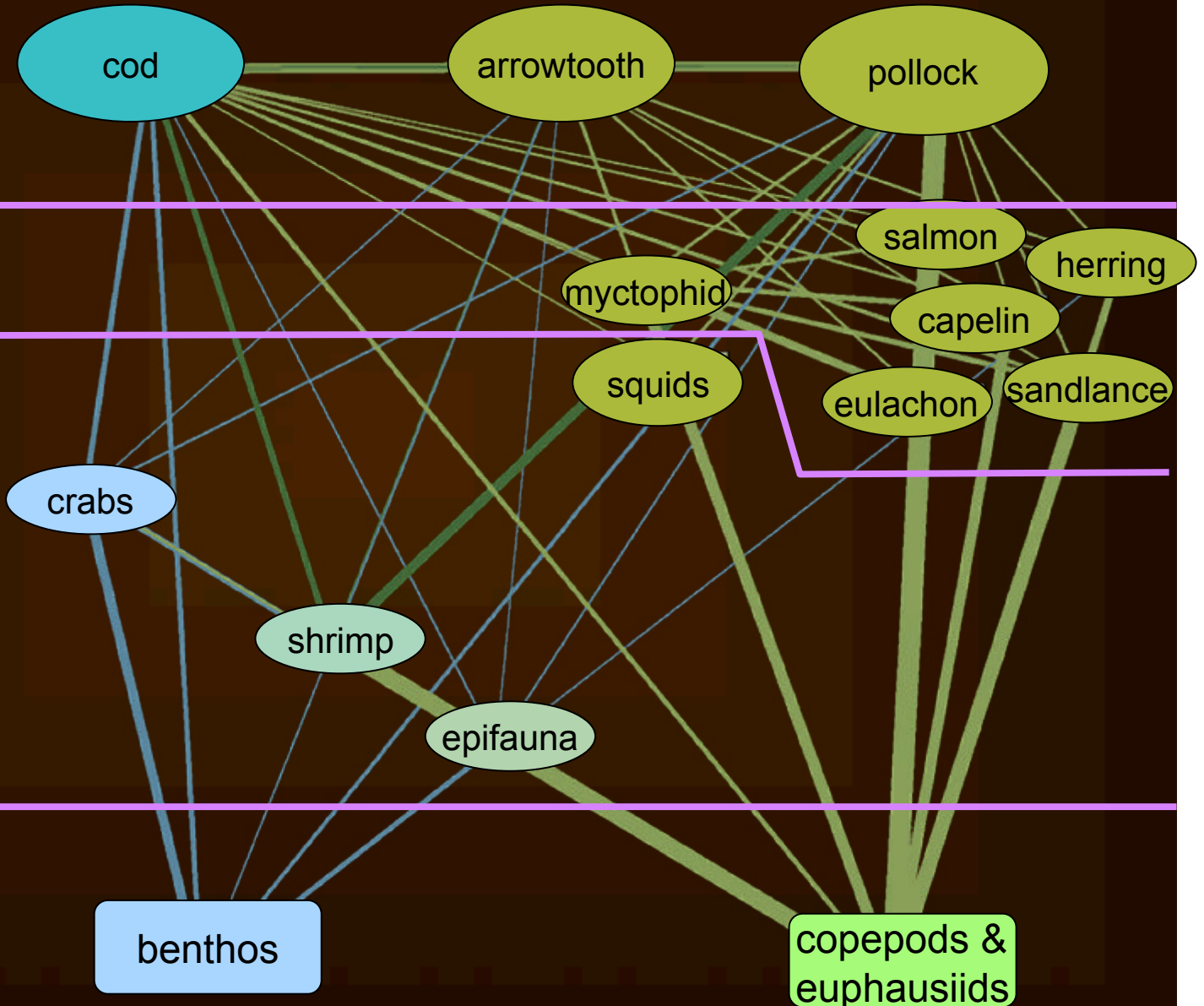
# FEAST

11 ages/ 15 lengths  
high detail

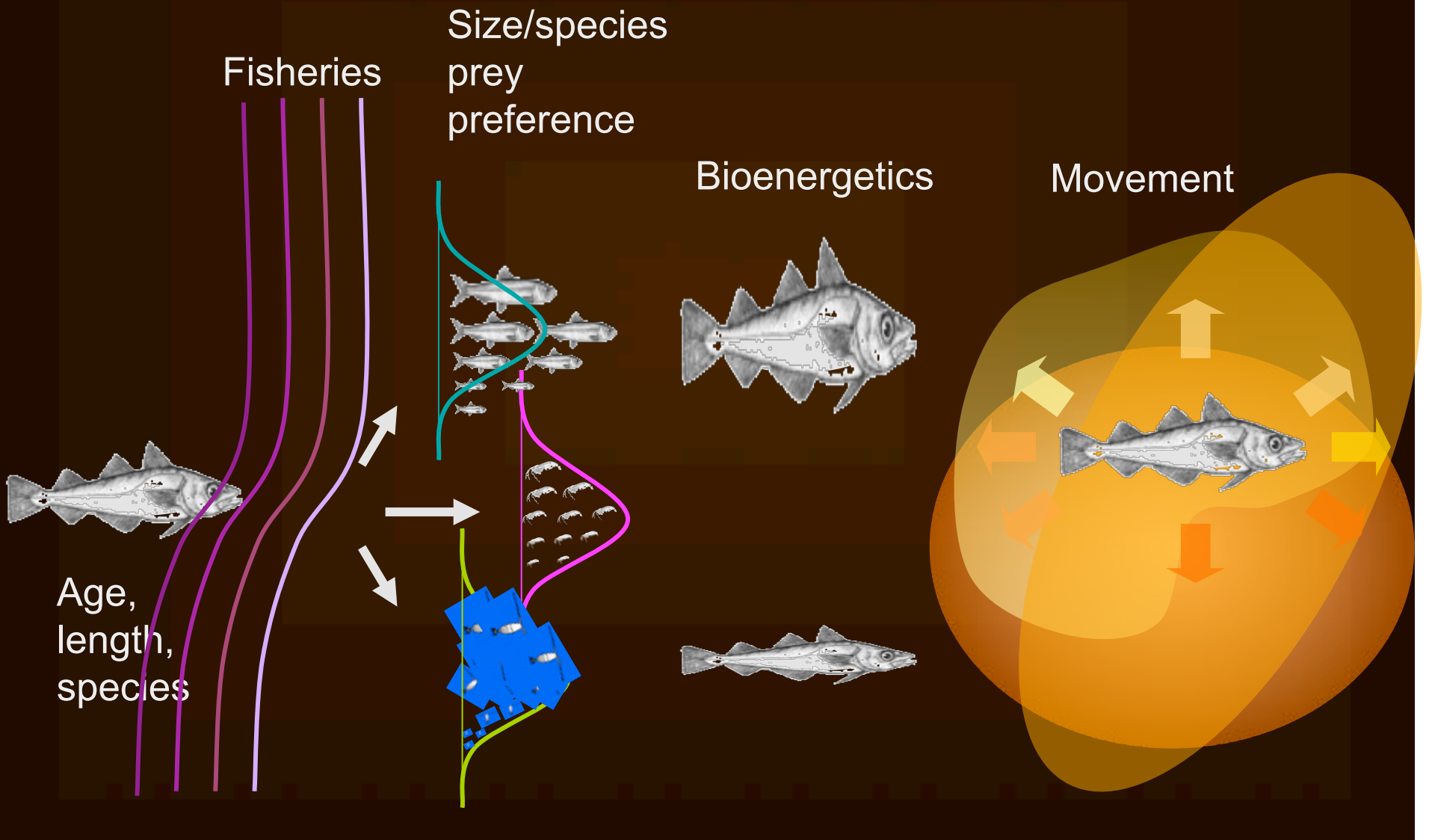
15 lengths  
medium detail

biomass pools  
low detail

NPZ



# FEAST





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# FEAST: 2 versions

## Full 3D

- Proof of concept
- Hypothesis testing (first principles)
- 60 vertical layers
- ~7 min timestep

## Simplified 3D

- 3D based correlations
- Faster for MSE
- 5 vertical layers
- ~30 minutes

- Same resolution 10km grid
  - Same species
  - Same fisheries



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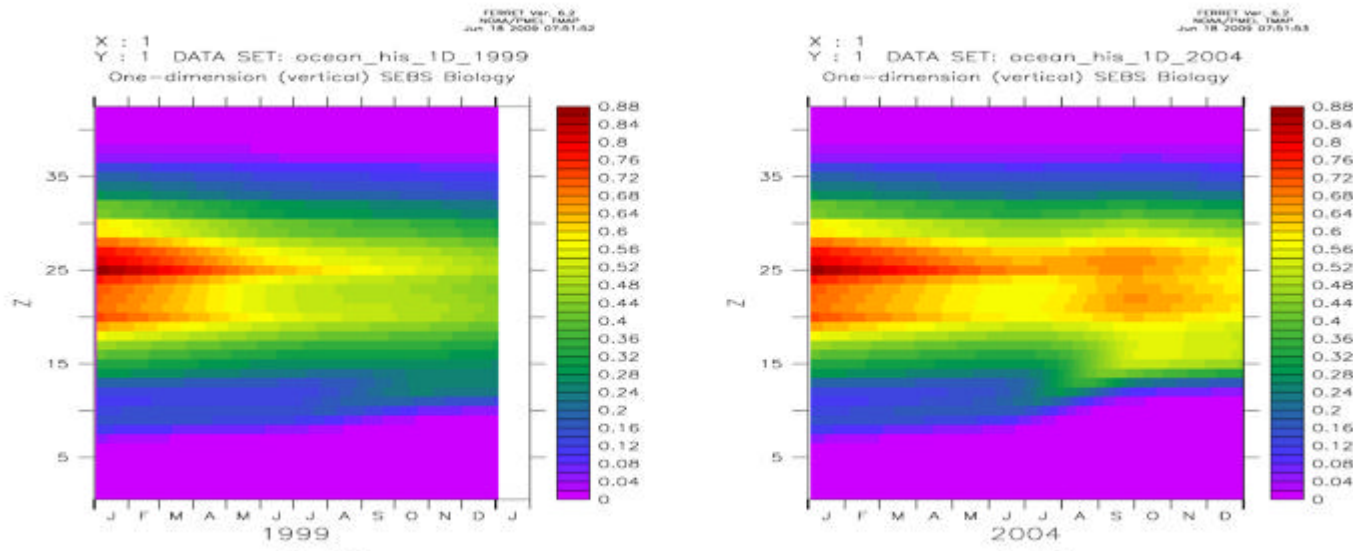
# Compared end to end models

	Horizontal / vertical resolution	Vertical move/ ocean model	Groups	Dynamics	MSE
FEAST	10 km x 60	No / Yes	~ 20	Age/size structured, bioenergetics/ biomass pool	Fisheries climate scenarios
APECOSM	1x1 degree x 3 layers	Yes	3	Bioenergetics Size based	N/A
NEMUROM	30 km x 60	Yes/ Yes	~6	IBM Bioenergetics	N/A
SEAPODYN	2 x 2 degree x 3 layers	No/ Yes	6	Age-structured	Fisheries
Atlantis	~15 regions x 8	Yes/ No	~ 60	Age-structured/ biomass pool	Multiple sectors
Invitro	GPS based	Yes/yes	~ 60	Agent based Hybrid	Multiple sectors

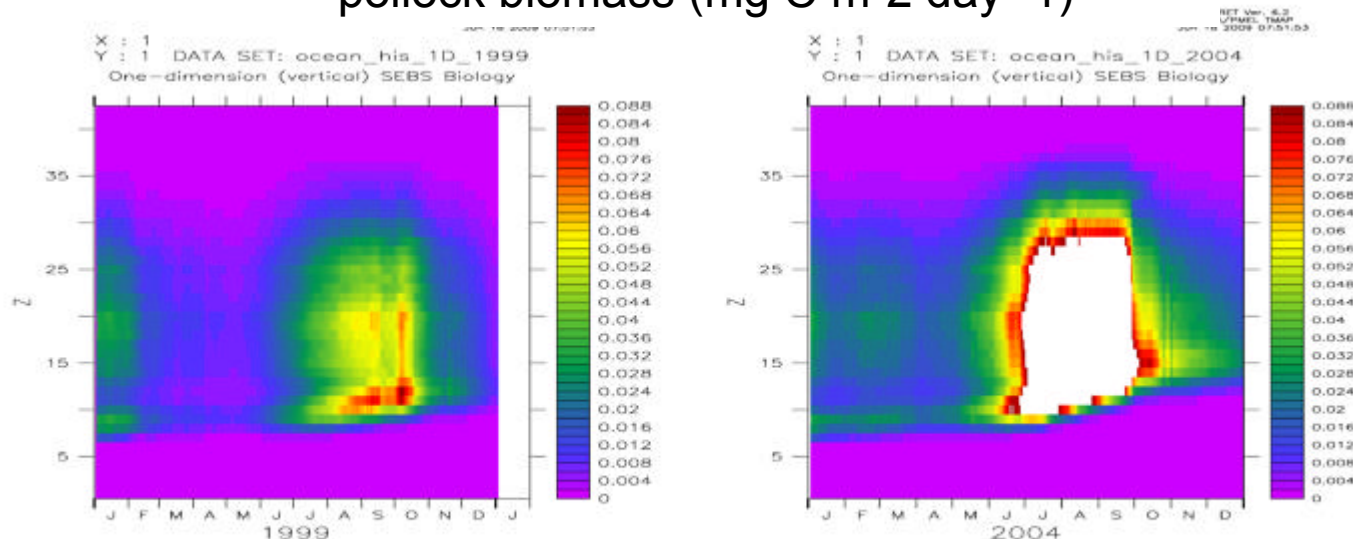
# COLD (1999) vs WARM (2004)



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pollock biomass (mg C m<sup>-2</sup> day<sup>-1</sup>)

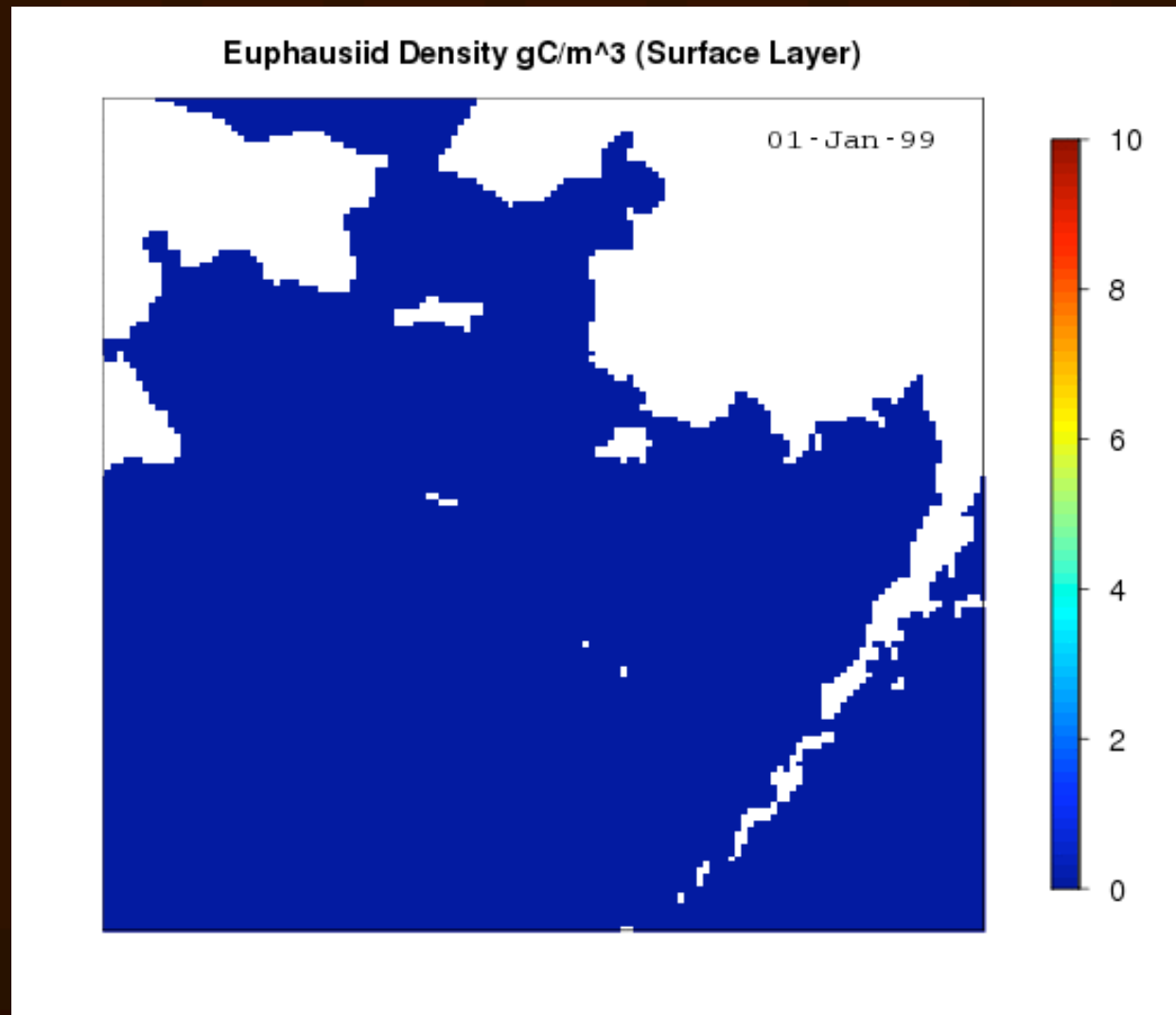


consumption by pollock



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# FEAST results





# Vertical modeling group



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MSE: Elizabeth Moffitt  
& Andre Punt

Economic & spatial  
fishery predictions

Econ: Mike Dalton & James Murphy,  
Charlotte Boyd



Upper trophic level  
(FEAST)

FEAST: Kerim Aydin, Ivonne Ortiz, Al  
Hermann



Lower trophic level  
(NPZ)

NPZ: Georgina Gibson



Physical Oceanography  
(ROMS)

ROMS/NEP5 Enrique Curchitser, Kate  
Hedstrom



Climate Scenarios

Climate: Nick Bond & Muyin Wang