

# Fifty years of ship-of-opportunity observations on the northeast U.S. continental shelf: results and management applications



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NOAA NMFS  
Narragansett Laboratory

# Outline

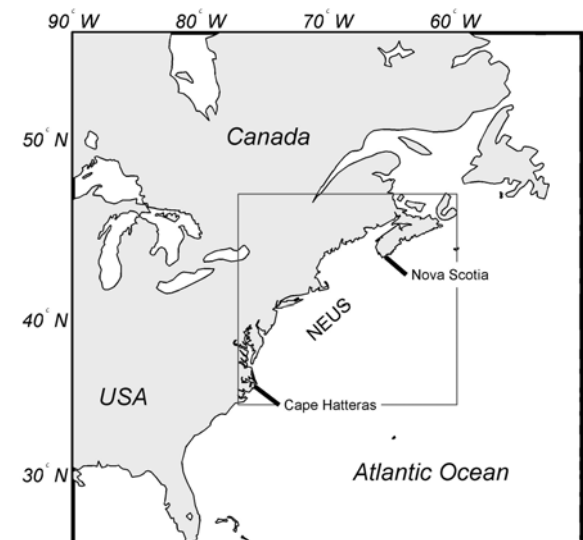
- Overview of the program
- Highlights of scientific results
- Summary of management applications
- Future Directions



# Overview of the program

## Northeast Fisheries Science Center Ecosystem Monitoring Program

- To monitor the fishery-relevant components of the plankton in the northeast U.S. shelf ecosystem
- To characterize baseline planktonic conditions and their variability
- To index the seasonal, annual, and decadal changes in planktonic conditions of the ecosystem



# Overview of the program

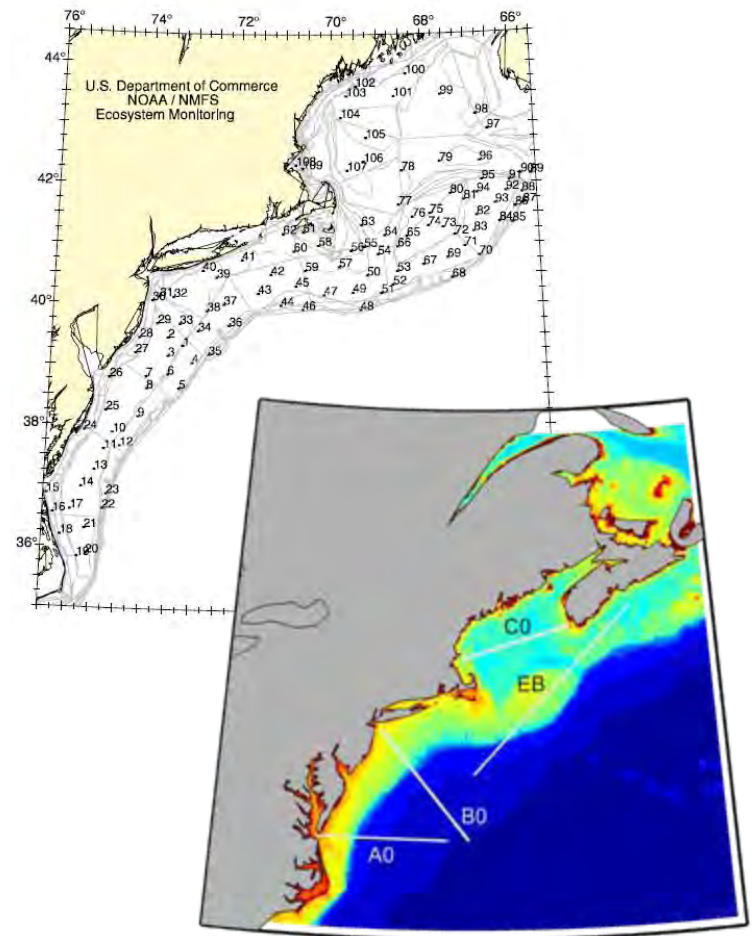
## Northeast Fisheries Science Center Ecosystem Monitoring Program

### Research Vessel Surveys

- 6-7 shelf wide surveys per year
- ~120 stations per survey
- 1977 to present

### SOOP Surveys

- Monthly transects
- Gulf of Maine and Mid-Atlantic Bight
- 1961 to present



# Overview of the program

## Northeast Fisheries Science Center Ecosystem Monitoring Program

### Part of Larger NMFS Observational Effort in Ecosystem

- Fall and spring trawl surveys
- Acoustic survey
- Dredge surveys
- Protected species ship-based and aircraft surveys
- Benthic habitat and mapping surveys



# Overview of the program

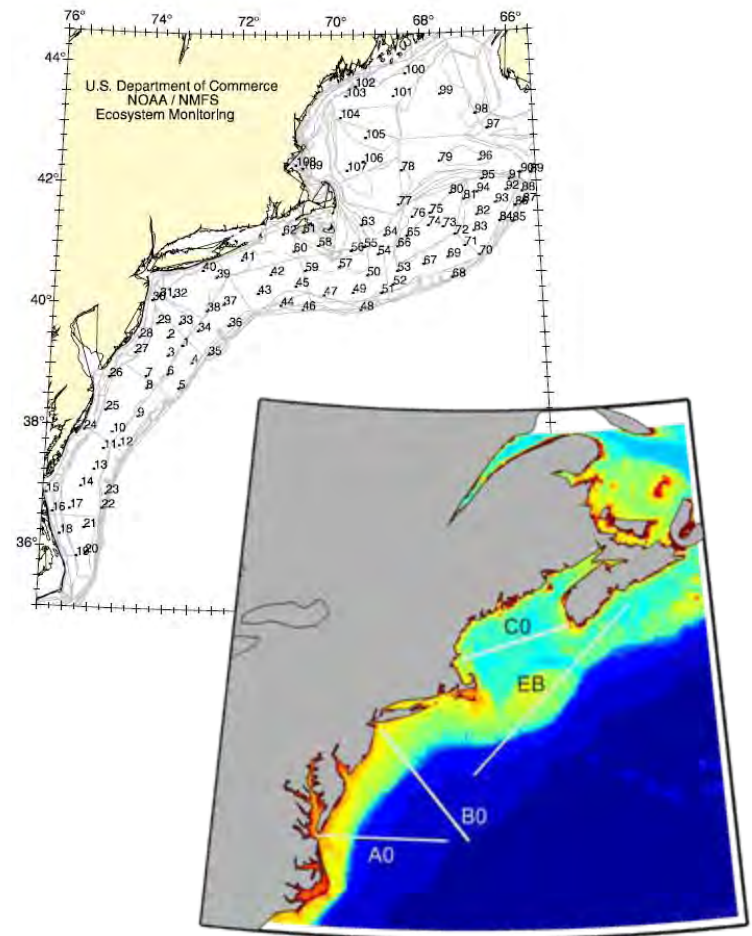
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# Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

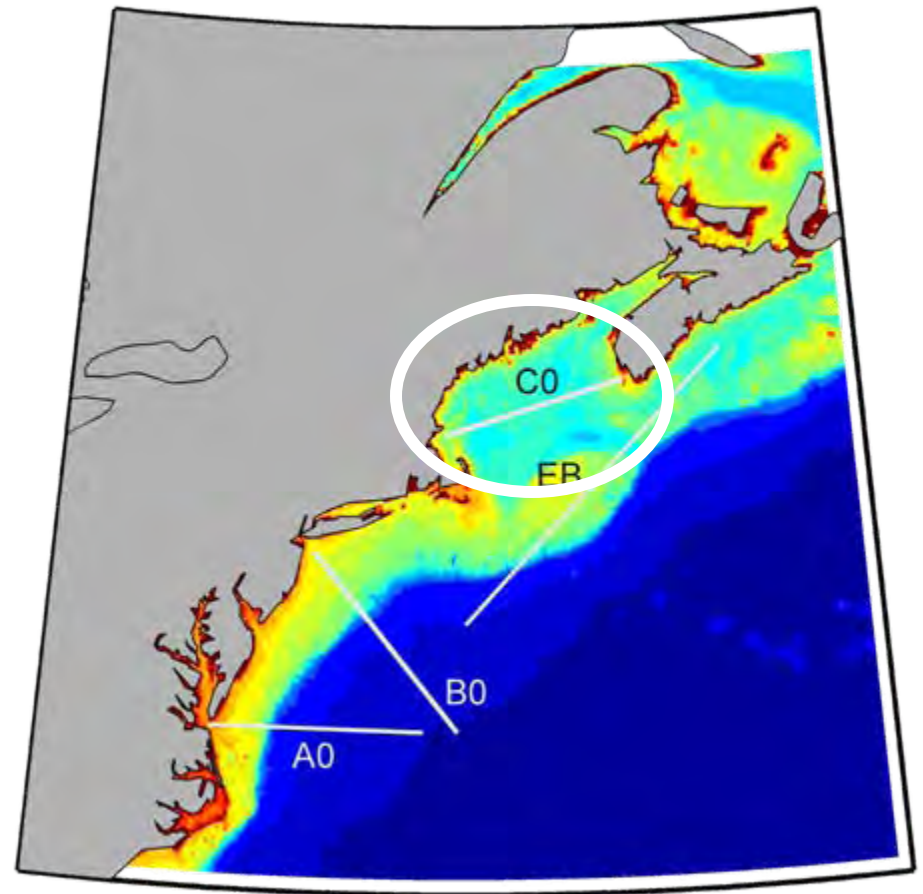
Route C0

1961-1974

Oceanographic  
Laboratory in  
Edinburgh, Scotland

1977-present

NOAA NMFS in  
Narragansett, USA



# Overview of the program

Four routes have been sampled by NMFS  
in Northwest Atlantic Ocean

Route EB

1961-1974

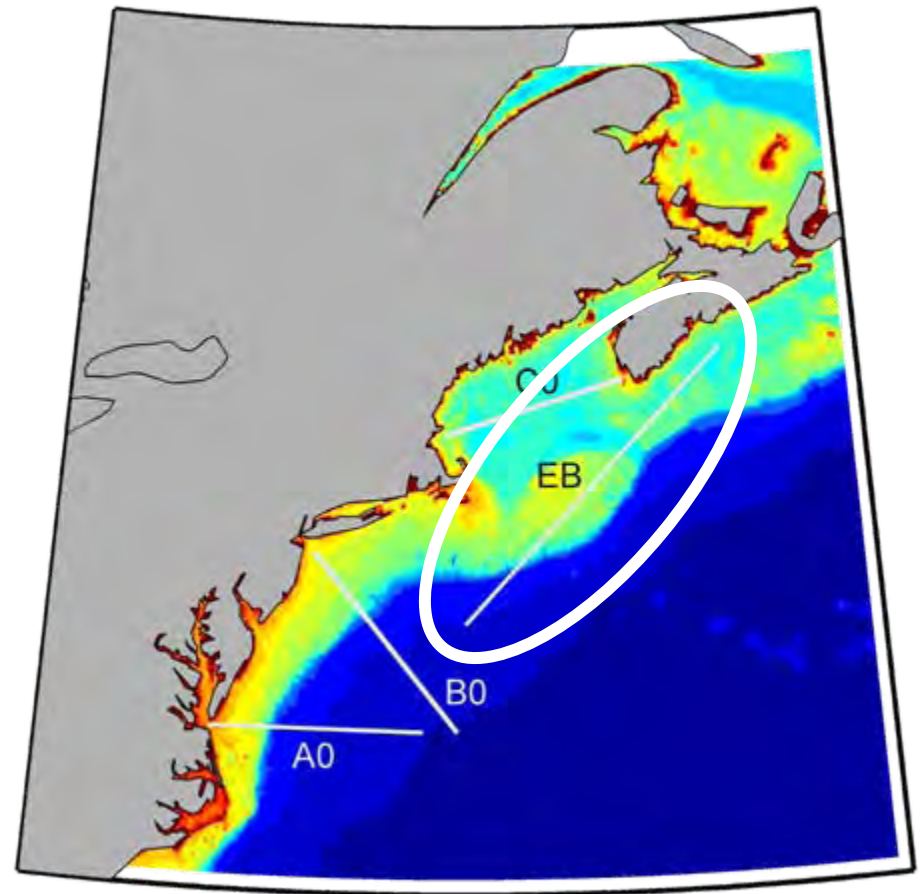
Oceanographic

Laboratory in

Edinburgh, Scotland

1991-present

SAHFOS, Plymouth, UK





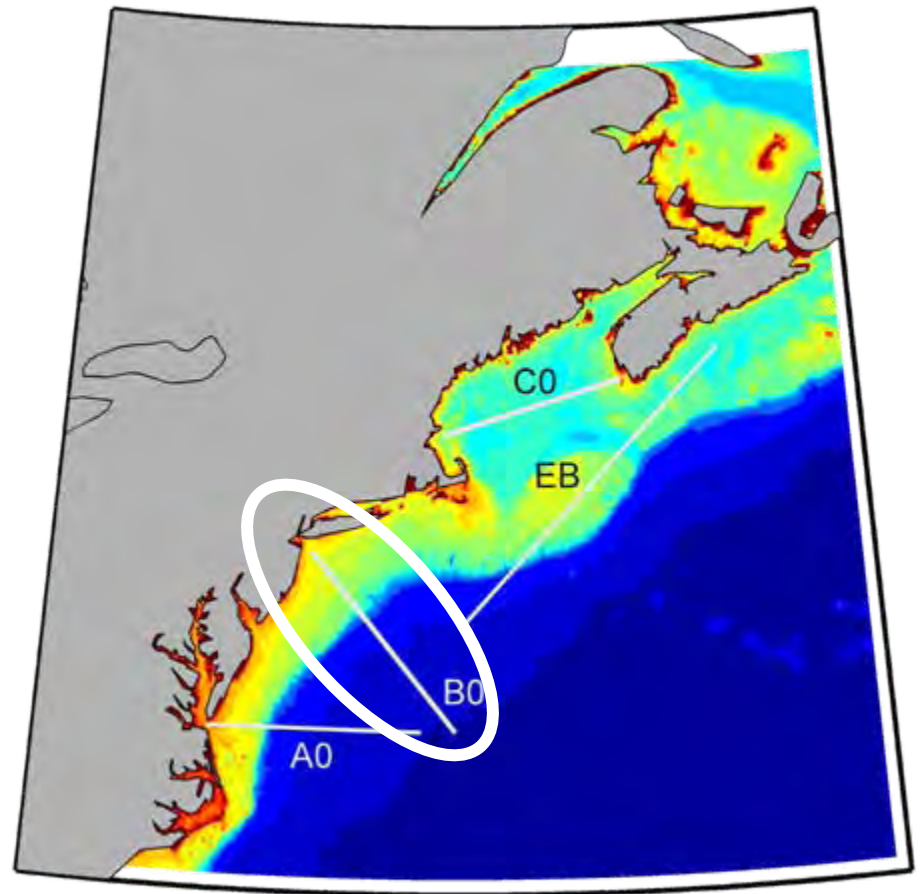
# Overview of the program

Four routes have been sampled by NMFS  
in Northwest Atlantic Ocean

Route B0

1976-present

NOAA NMFS in  
Narragansett, USA



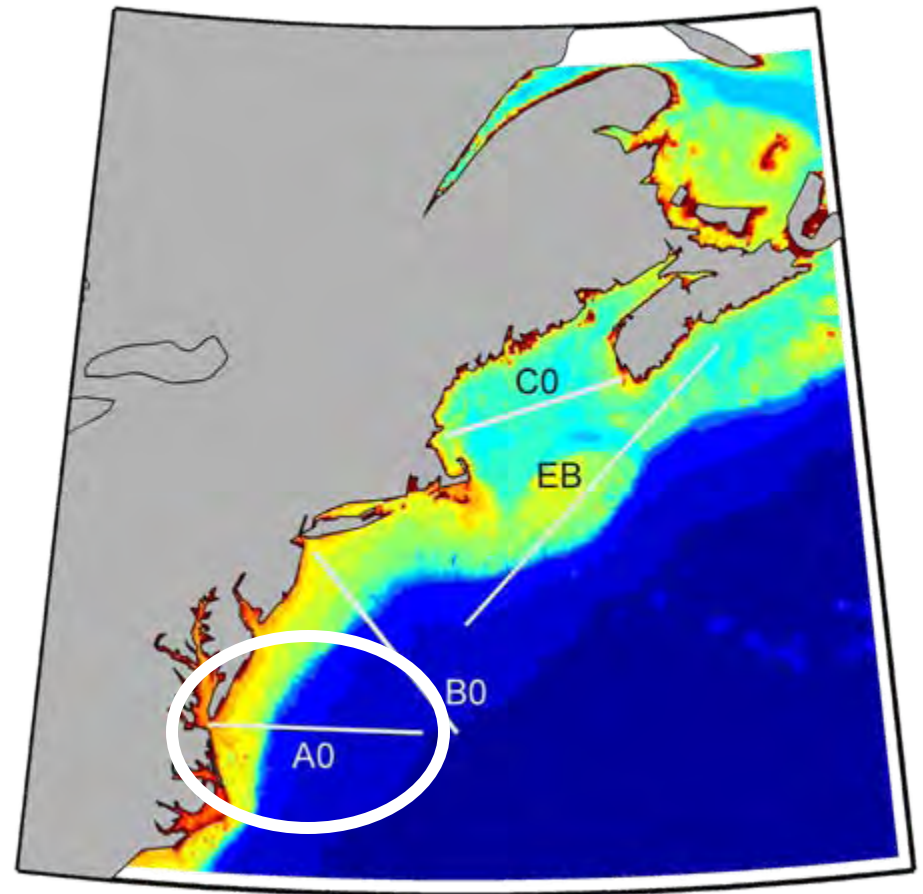
# Overview of the program

Four routes have been sampled by NMFS in Northwest Atlantic Ocean

Route A0

1974-1980

NOAA NMFS in  
Narragansett, USA



# Overview of the program

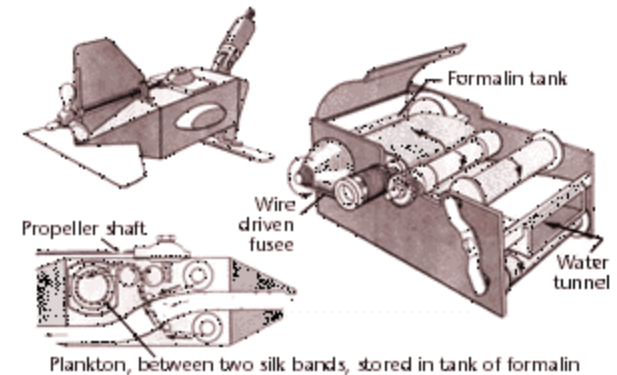
## Continuous Plankton Recorder

Zooplankton species counts

Phytoplankton species counts

SAHFOS Sister Survey

In collaboration with SAHFOS and  
Morski Instytut Rybacki - Gdynia Poland

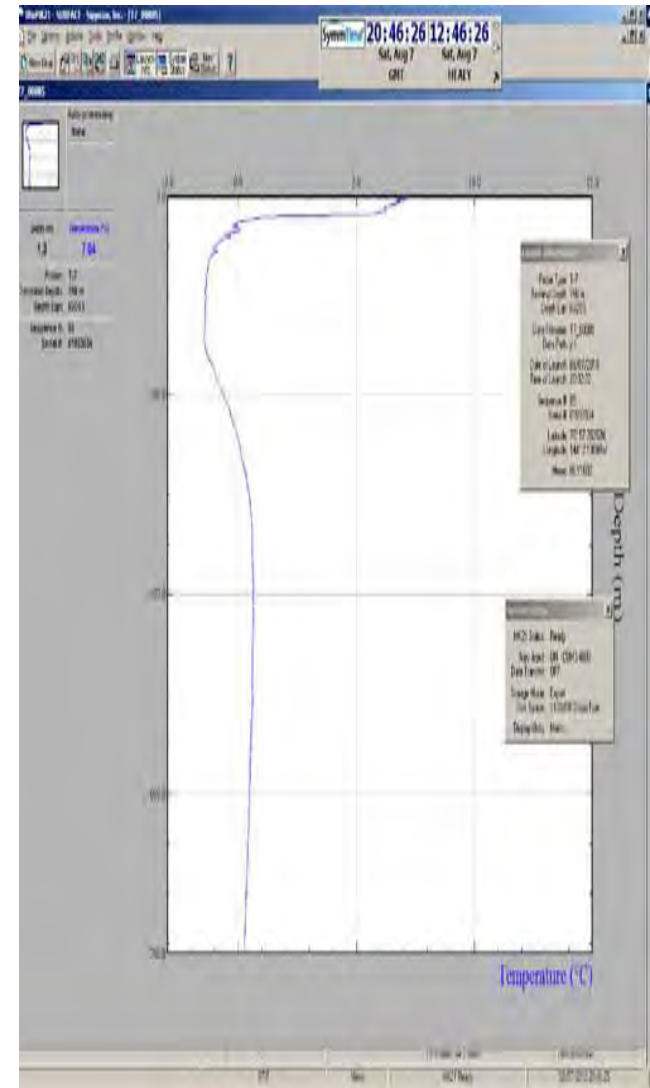


# Overview of the program

## Hydrographic Sampling

Expendable Bathythermographs (XBT) and Thermosalinographs

In collaboration with NOAA Atlantic Oceanographic and Meteorological Laboratory, Miami and Laboratoire d'Etudes en Géophysique et Océanographie Spatiales, Toulouse



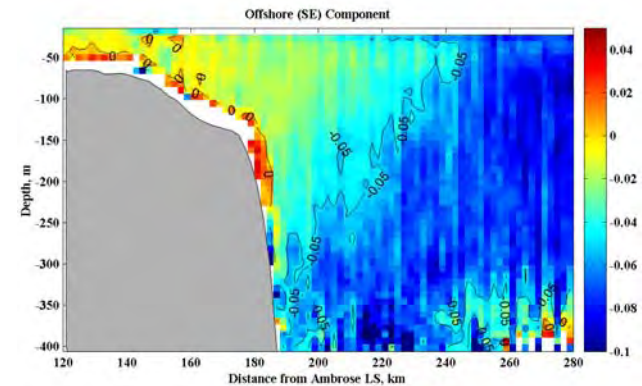
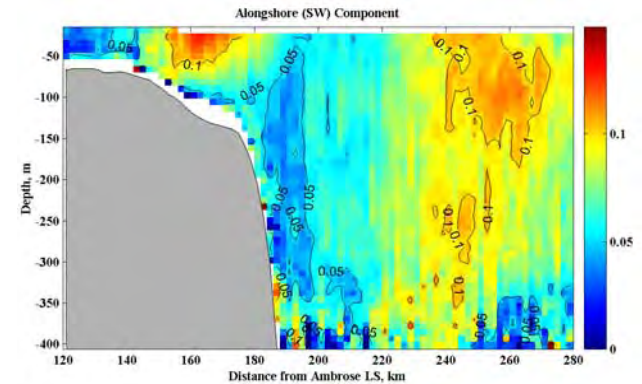


# Overview of the program

## Ocean Current Sampling

75kHz Ocean Surveyor ADCP on  
B0 route (in collaboration with  
URI/SUNY Oleander Project)

Drifters are deployed (in  
collaboration with NOAA Global  
Drifter Program)



10 year average along B0  
line (Flagg et al. 2006)

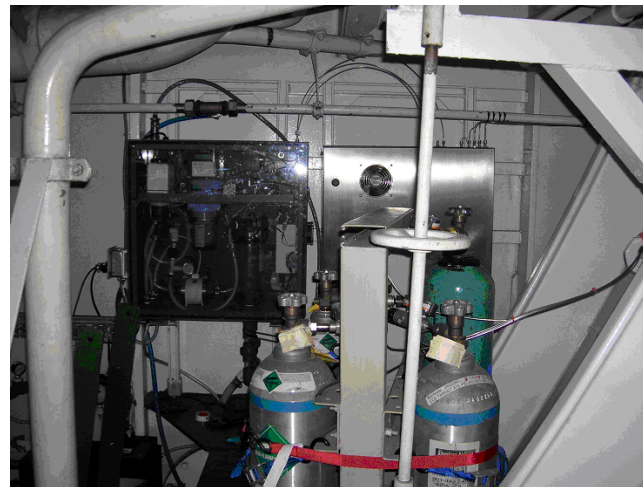
# Overview of the program

## Water Sampling

Water samples for TSG calibration

pCO<sub>2</sub> systems (in collaboration with Bermuda Biological Station and AOML)

Working to expand ocean acidification monitoring efforts





# Outline

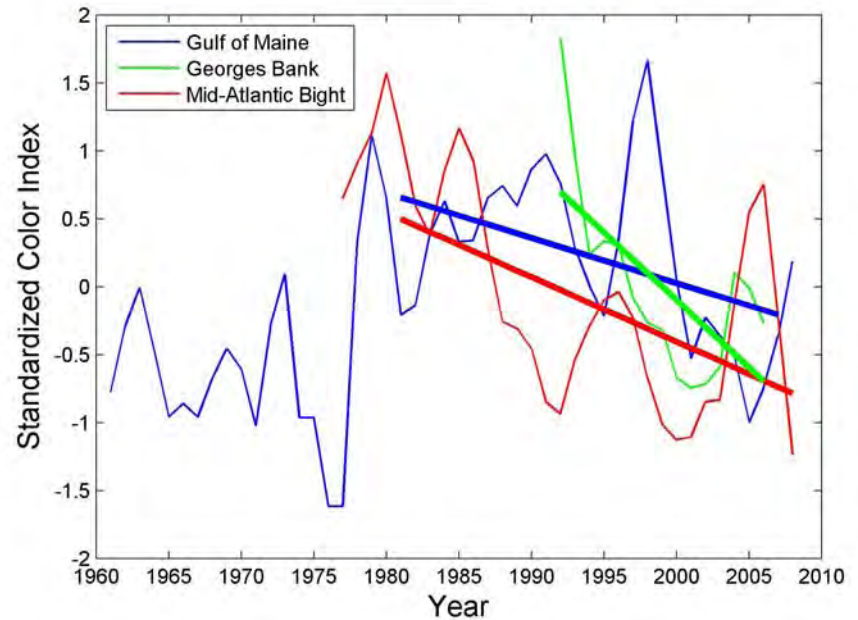
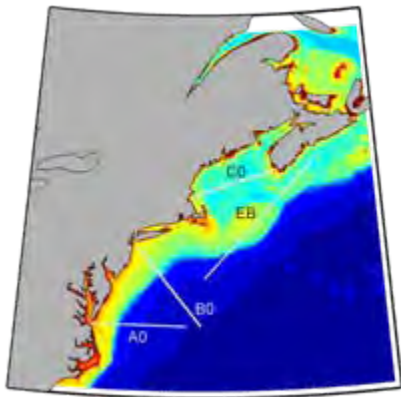
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# Highlights of current results

## Phytoplankton Abundance & Timing

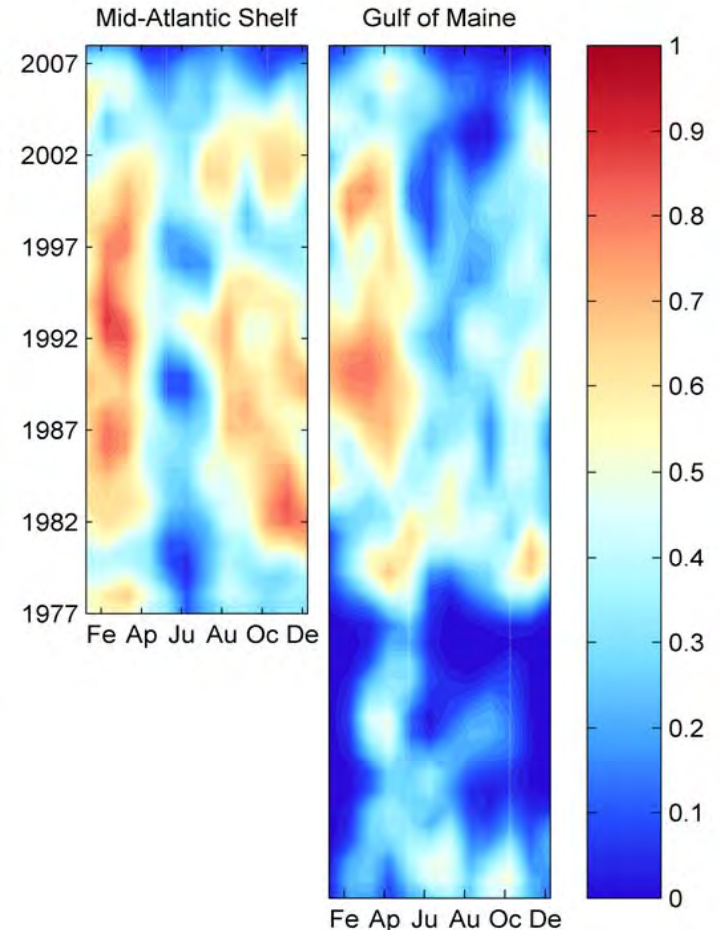
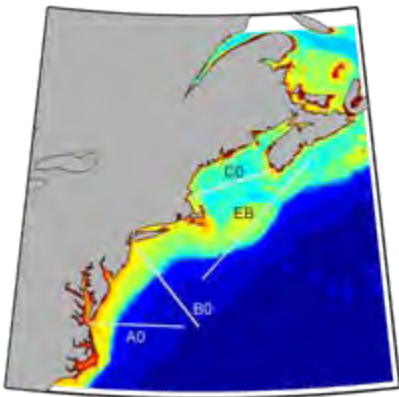
Decreases in system-wide color index  
(measure of total amount of large-fraction chlorophyll)



# Highlights of current results

## Phytoplankton Abundance & Timing

Variability and overall decreases in the percentage of diatoms (remember large-fraction bias)

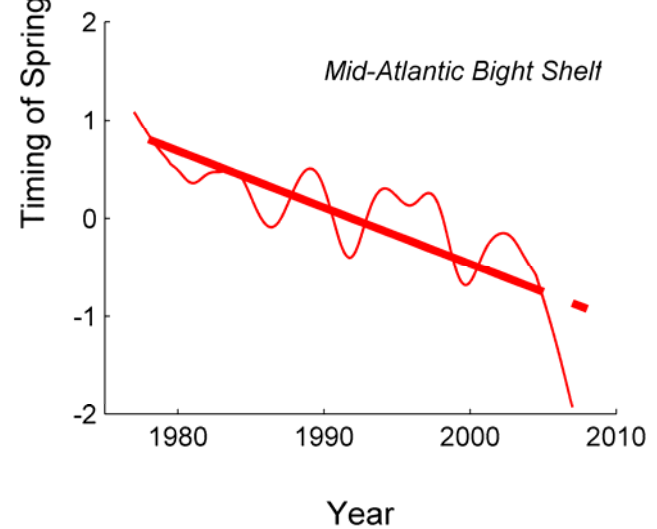
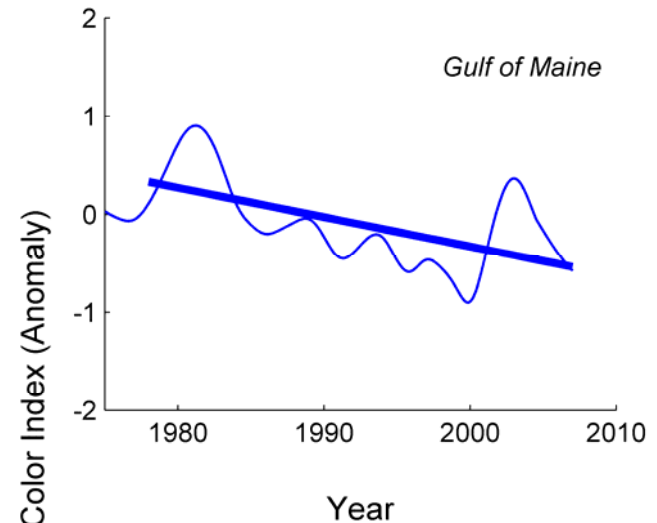
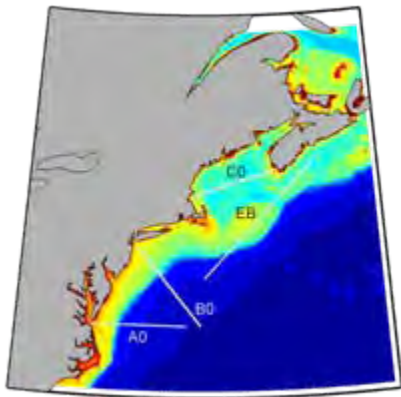


Hare et al (in prep)

# Highlights of current results

## Phytoplankton Abundance & Timing

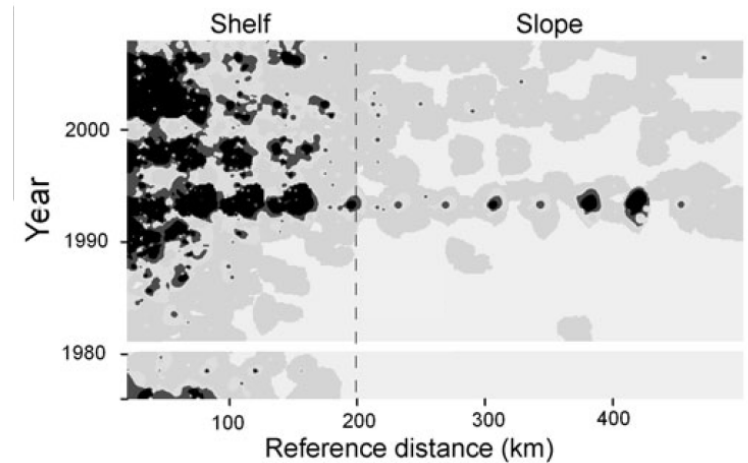
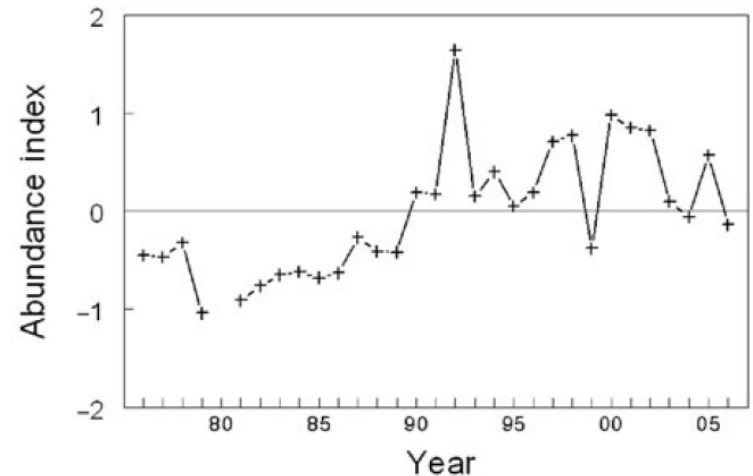
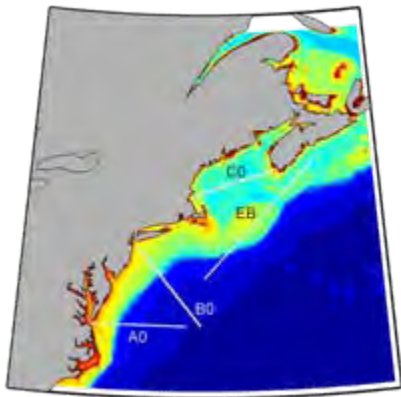
Shifting of spring  
bloom to earlier (more  
than 1 month over  
course of time series)



# Highlights of current results

## Zooplankton Abundance & Timing

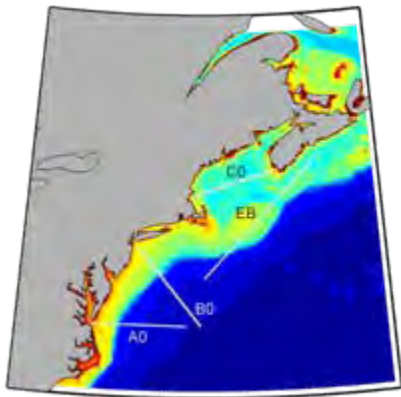
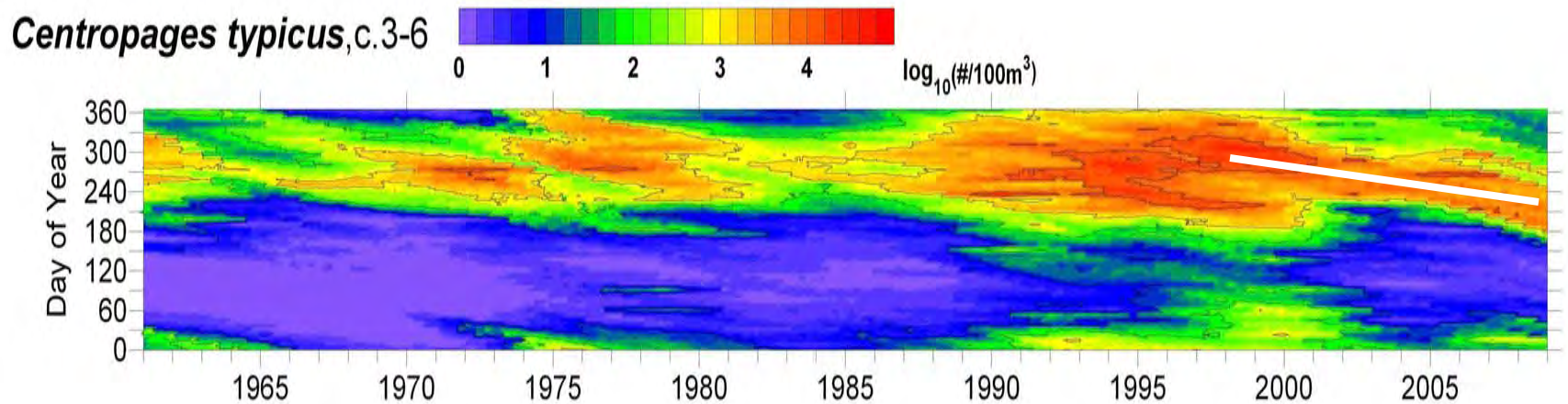
Increase in *Temora longicornis* abundance and expansion of distribution



Kane and Prezioso (2008)

# Highlights of current results

## Zooplankton Abundance & Timing



Variability in  
*Centropages typicus*  
abundance and a  
change in timing

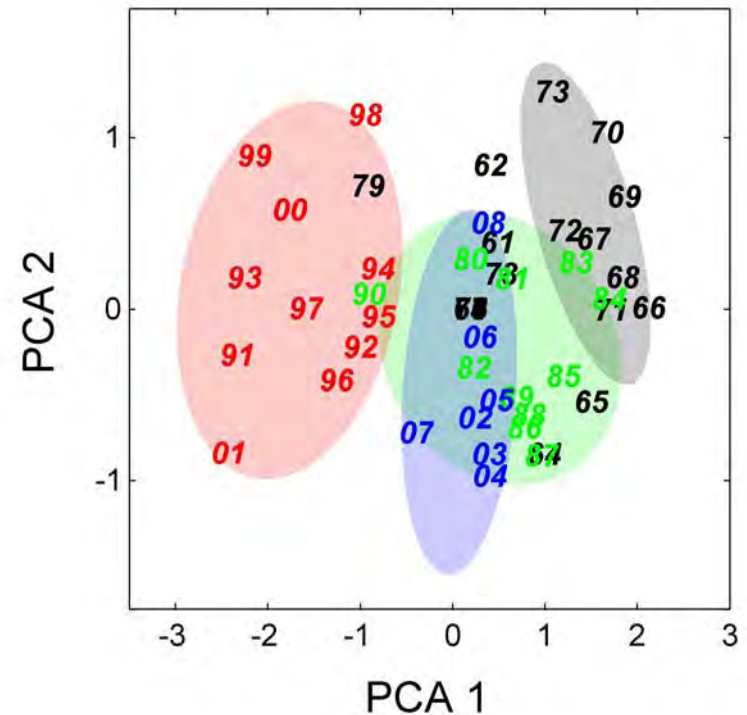
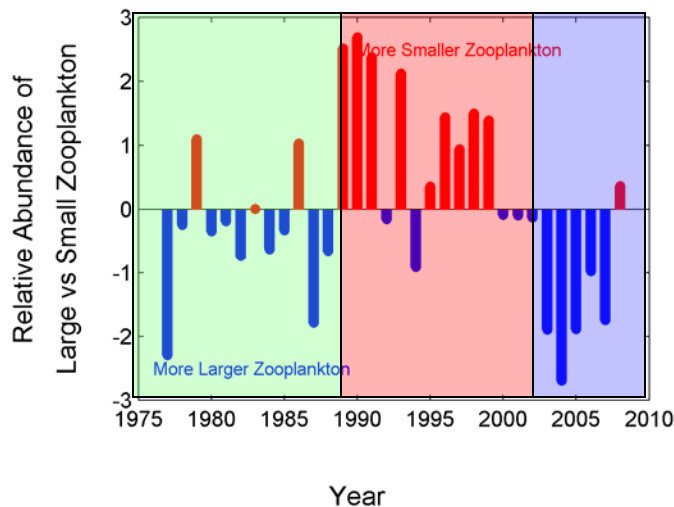
Jossi and Kane (in prep)



# Highlights of current results

## Zooplankton Abundance & Timing

Distinct temporal  
zooplankton assemblages  
related to contrast  
between smaller and  
larger species

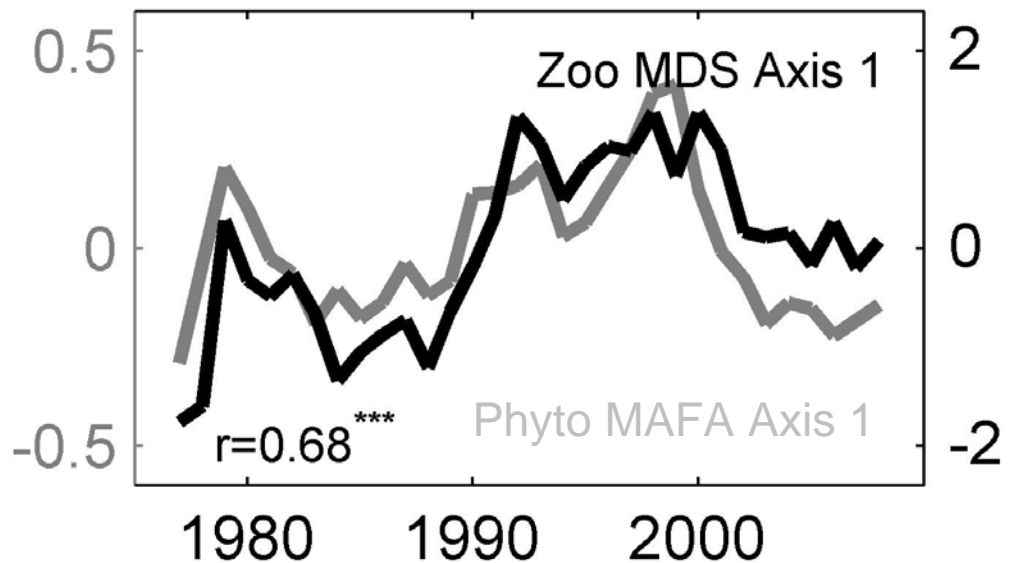


Re-analysis of Pershing et al. (2005)  
From Hare and Kane (in review)

# Highlights of current results

## Phytoplankton – Zooplankton Relation

Primary axes of variation in phytoplankton and zooplankton are related



**Currently  
evaluating both  
bottom-up and to-  
down hypotheses**

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# Management Applications

## Data Products

- NEFSC Ecosystem Assessment Products
- ICES Zooplankton and Oceanic Hydrography Reports
- NOAA Contributions to GOOS



Northeast Fisheries Science Center Reference Document 09-11

### **Ecosystem Advisory** For the Northeast Shelf Large Marine Ecosystem

Northeast Fisheries Science Center, Narragansett, Rhode Island

Advisory 2010-No.1

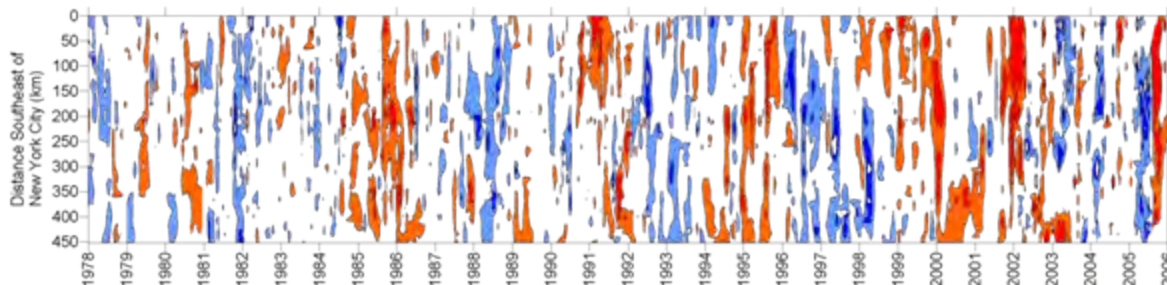


### Ecosystem Status Report

Northeast U.S. Continental Shelf Large Marine Ecosystem

#### Summary of Conditions of the Northeast Shelf Ecosystem

- Sea surface temperature (SST) in the Northeast Shelf Large Marine Ecosystem during the second half of 2009 alternated between moderately warm and cool conditions.
- There were substantial spring and fall phytoplankton blooms on the Northeast Shelf. As a result, 2009 had the highest productivity of the



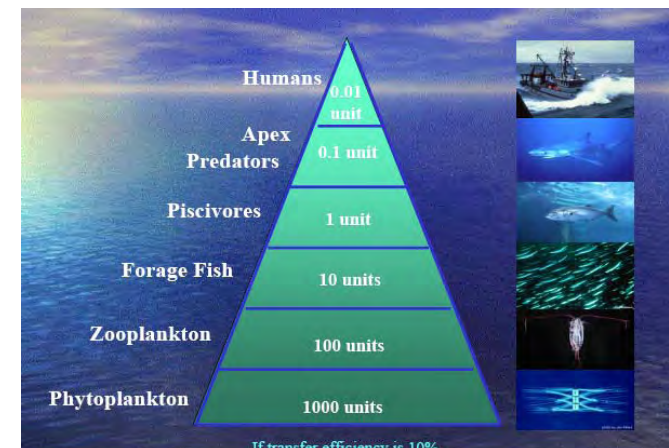
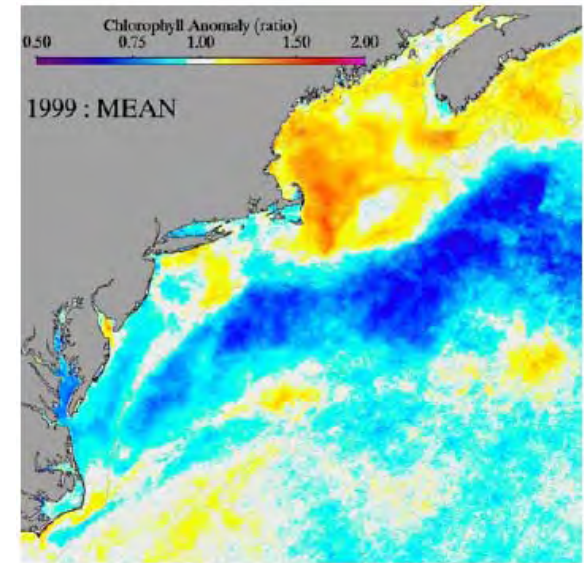
by the Ecosystem Assessment Program

July 2009

# Management Applications

## Potential inclusion in system-wide trophic-transfer model

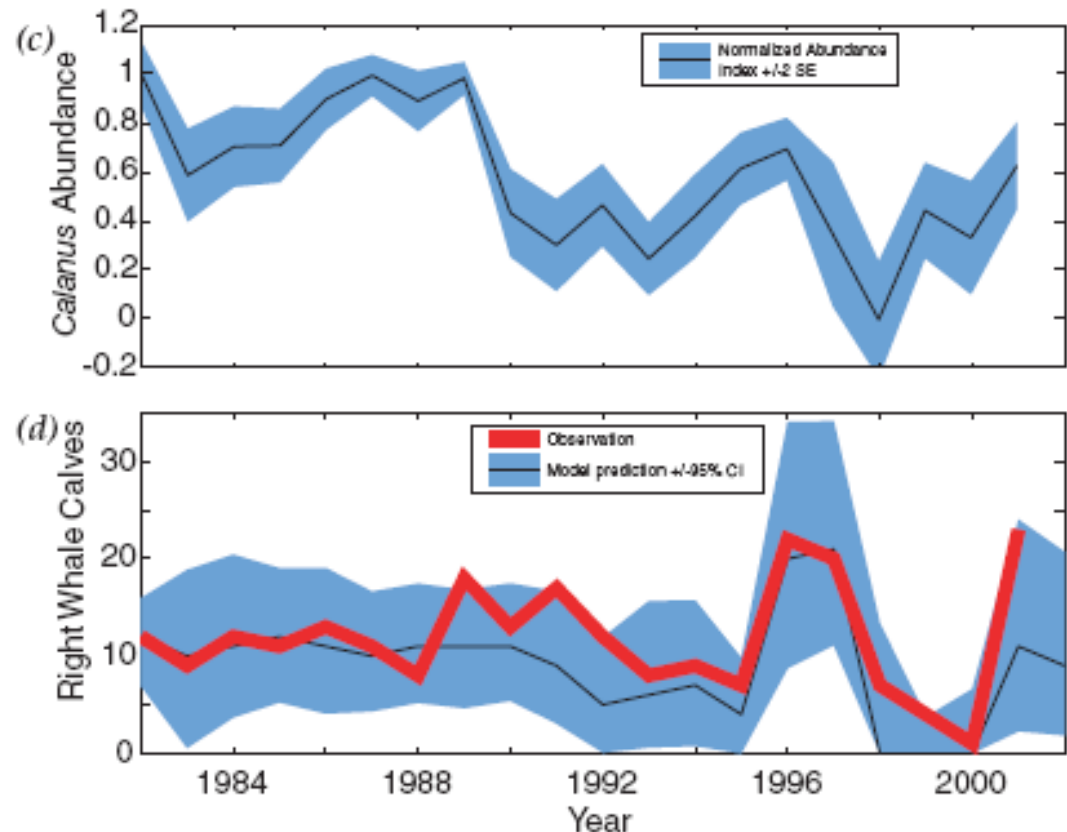
- Currently working on blended CPR, CZCS, *in situ* chlorophyll, SeaWIFS product
- Will be used in a trophic transfer model to estimate system-level fisheries productivity over time
- Will be provided to Fishery Management Council's as part of Fishery Ecosystem Plans



# Management Applications

## Right-whale calving rate model

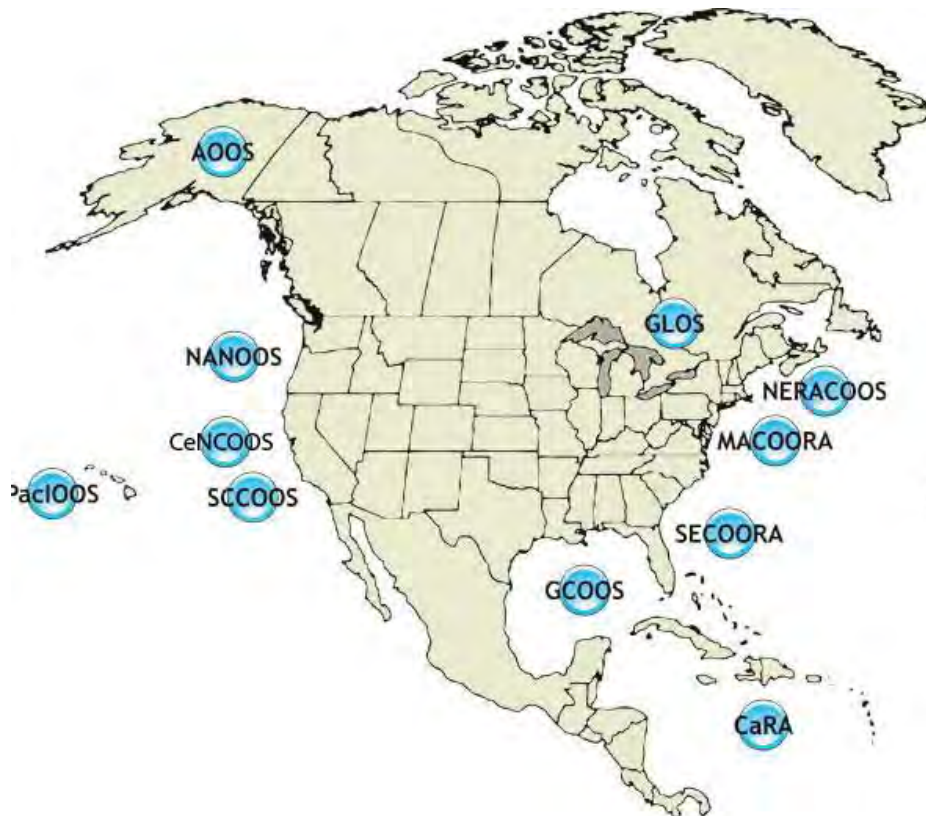
- Calving rate of endangered right whale function of *Calanus finmarchicus* abundance
- Working on operational model to extend initial work





# Management Applications

## Integrating with Regional Ocean Observing Systems



**NERACOOS**

Home About Products Projects Focus Areas Data Access Calendar Education

Welcome to NERACOOS! The Northeastern Regional Association of Coastal Ocean Observing Systems is a component of the national IOOS, spanning coastal waters from the Canadian Maritime Provinces to the New York Bight. Our mission is to make available information to those who use these waters. We provide weather and ocean data to fishers and commercial shippers determining if conditions are safe for passage and to emergency managers issuing storm warnings. We are also advancing efforts to use these data for water quality monitoring, harmful algal bloom predictions and warnings, and coastal flooding and erosion forecasting systems.

Zoom to: -select-

**Real-time Data from NERACOOS**

This map displays real-time observations from buoys and monitoring stations in the Northeast region.

- Click a station icon to get the latest observations.
- Click a variable name to see 12-hour trend.
- Click tide stations to see tide graph.

Due to atmospheric or other conditions, latest data may not always be available.

NOTICE: These real-time data are considered provisional. Please read the definition of [provisional data](#) and their inherent limitations.

Like 139 people like this.

**MARCOOS**  
Mid-Atlantic Regional Coastal Ocean Observing System

Home Partners Meetings Progress Presentations Publications Data HF-Radar Data Products

# Outline

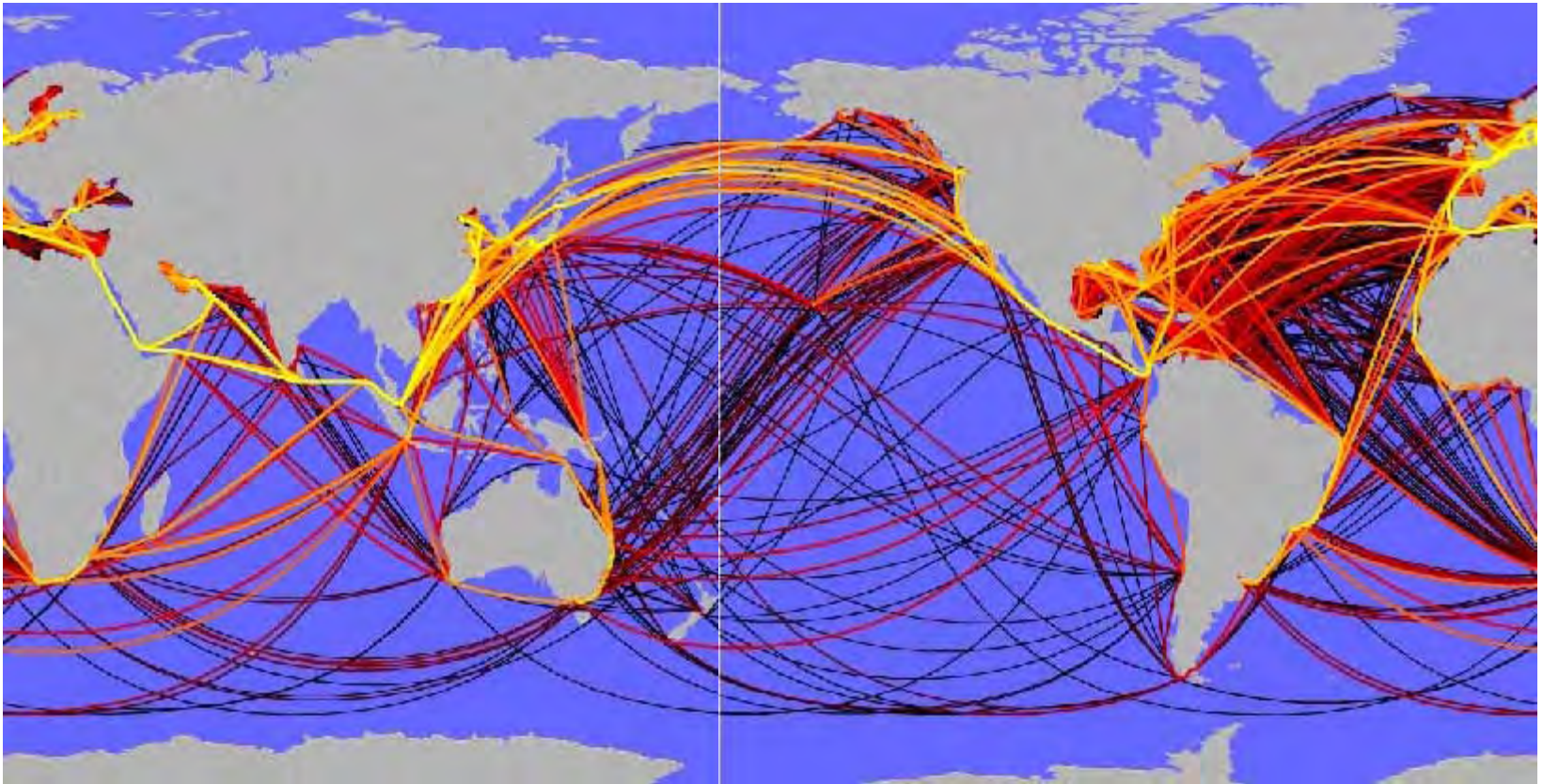
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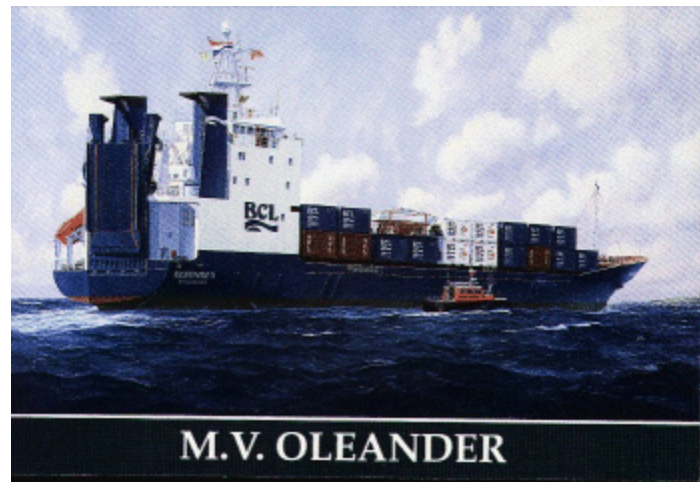
# Future Directions

Ships of Opportunity present  
**opportunities**



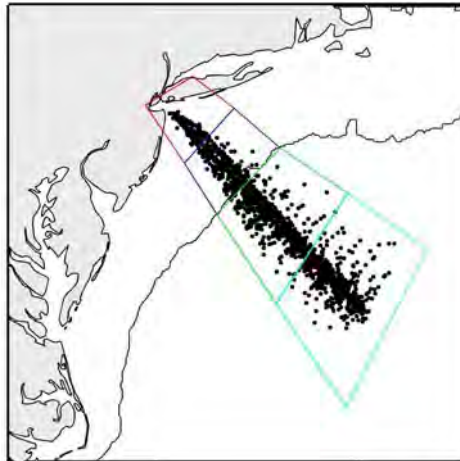
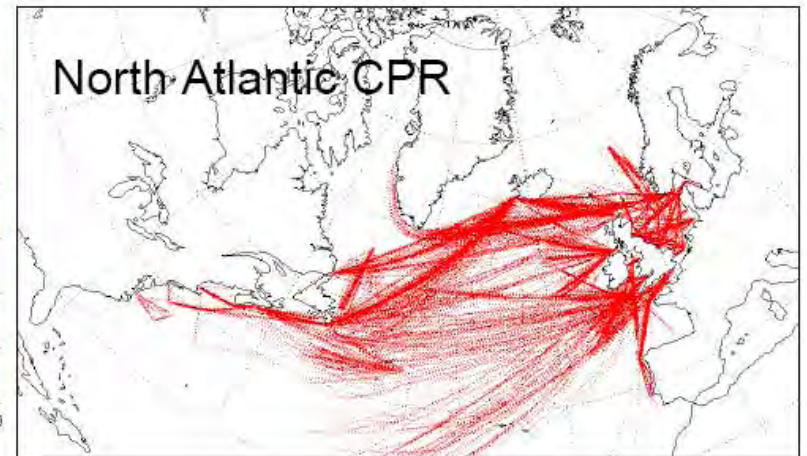
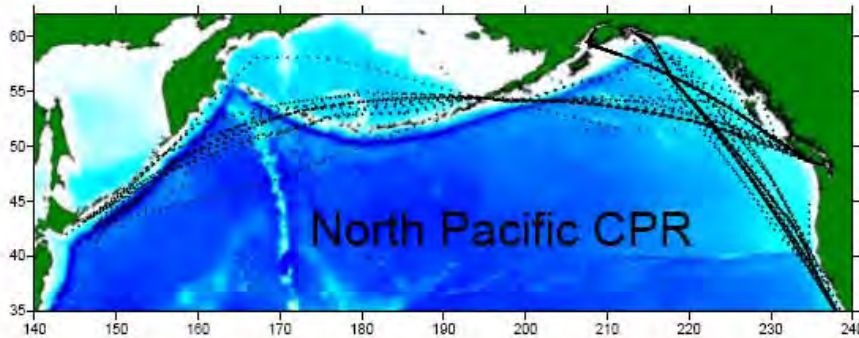
# Future Directions

Collaborative platforms for sustained ocean observations



# Future Directions

Interested in contributing to increased CPR operations in the Pacific





# Future Directions

Contributing to trial CPR tow on NOAA  
Ship Okeanus Explorer

Guam to Hawaii / Hawaii to West  
Coast

